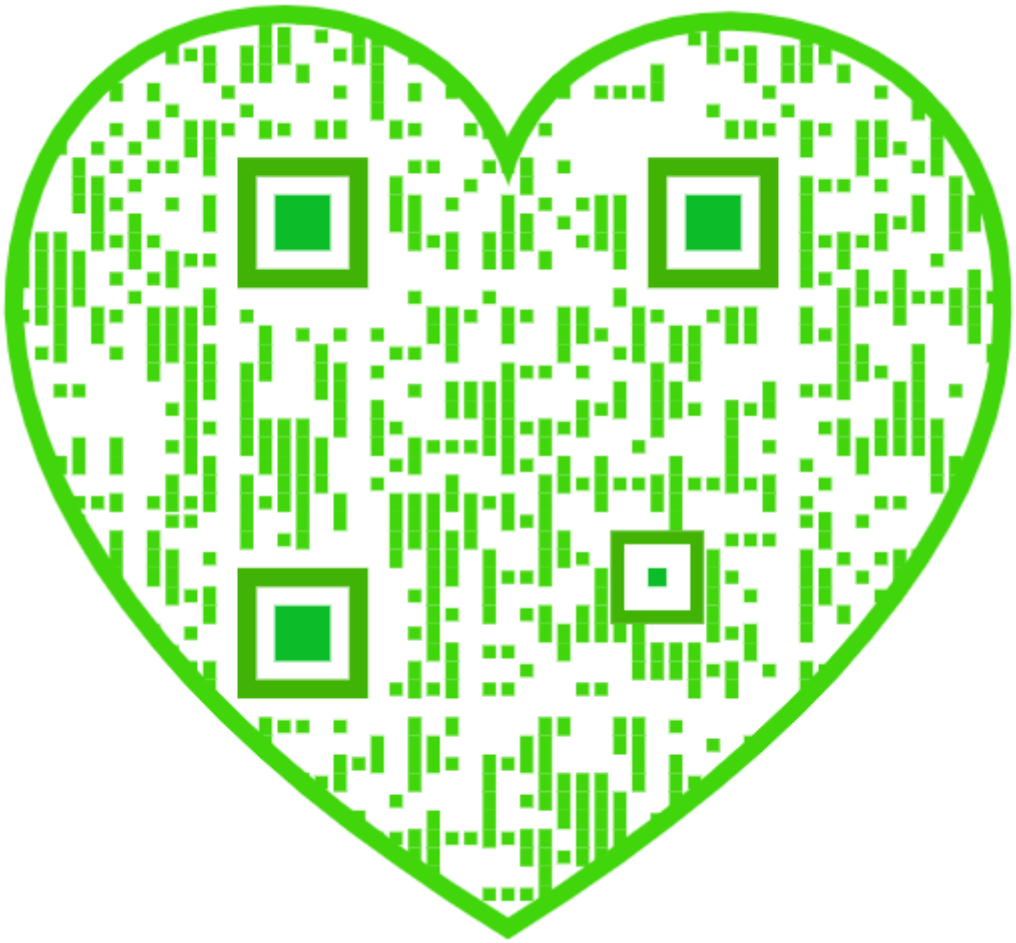
SCIENTIFIC AMERICAN

AUTOMOBILE NUMBER

PUBLISHED BY MUNN & CO NEW YORK, U.S.A.

PRICE 10 C

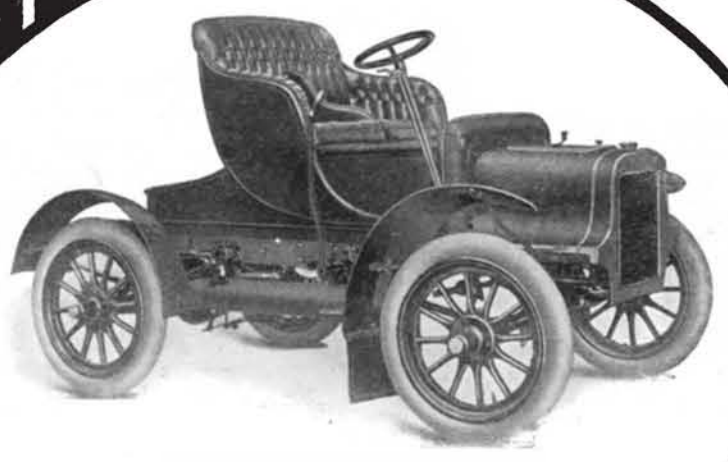


The Car that Achieves

The Cadillac has always been the car that *does* things. Whether the test be that of endurance or power, or one of severity of road service, this wonderful machine has never been found wanting. It knows no balk, no hesitancy, no delay—always ready, with energy to spare.

By this dependability of service, coupled with unusual economy of maintenance, the Cadillac has made such phenomenal advancement that its factory is now the largest of its kind in the world.

The qualities upon which this unparalleled growth is based are more pronounced than ever in the magnificent new cars for 1906. Embodied in these are many unique and important improvements — improvements which make the

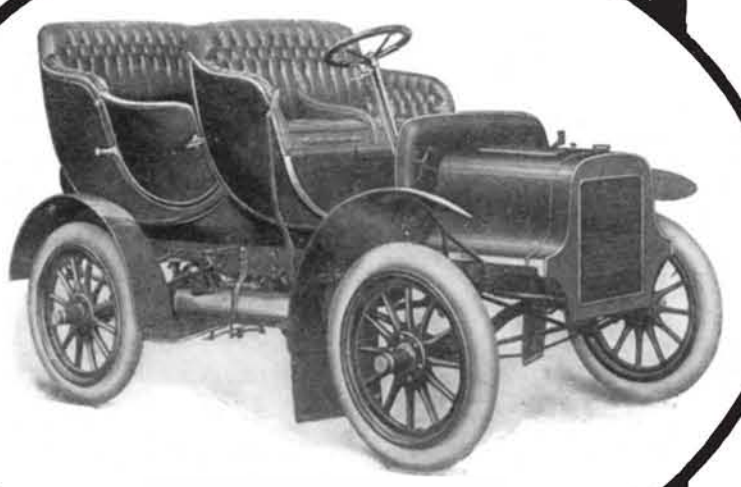


Model K, 10 h. p. Runabout, $750, f. o. b. Detroit.

CADILLAC

conspicuous for its *individual* merit.

Among them is a wonderful mechanical feed lubricator which supplies oil to the motor in quantities which vary according to the speed of the engine, when properly adjusted, always feeding enough, never too much or too little. The new rocker joint on the front spring allows the car to pass over obstacles several inches in height without transmitting any material jar to the car, insuring a maximum of riding comfort and a minimum liability to breakage.



Model M, Light Touring Car, $950, f. o. b. Detroit.

In outline and finish these new Cadillacs are truly art creations. Of the Victoria type, their grace and exquisite beauty, their tone of quiet richness, appeal at once to fastidious motorists.

We want to tell you more about the Cadillac by sending you a free copy of our interesting Booklet N. A postal request brings it, together with address of nearest dealer. The 1906 models include:

Model K, 10 h. p. Runabout, $750.
Model M, Light Touring Car, $950.
Model H, 30 h. p. Touring Car, $2,500.
Model L, 40 h. p. Touring Car, $3,750.

All prices f. o. b. Detroit.

CADILLAC MOTOR CAR COMPANY, Detroit, Mich.

Member Asso. Licensed Auto. Mfrs.

SCIENTIFIC AMERICAN

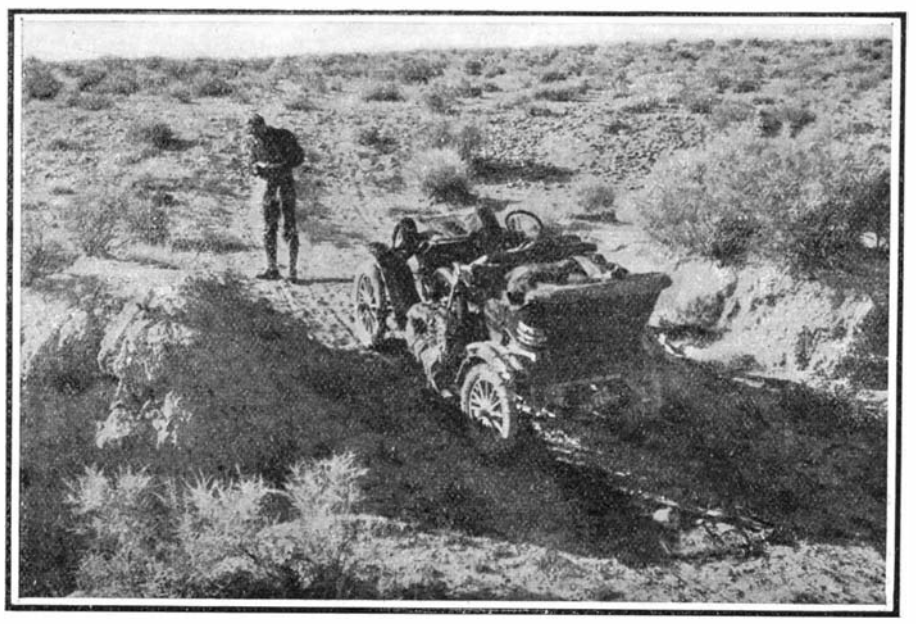
[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1906, by Munn & Co.]

Vol. XCIV.—No. 2.
ESTABLISHED 1845.

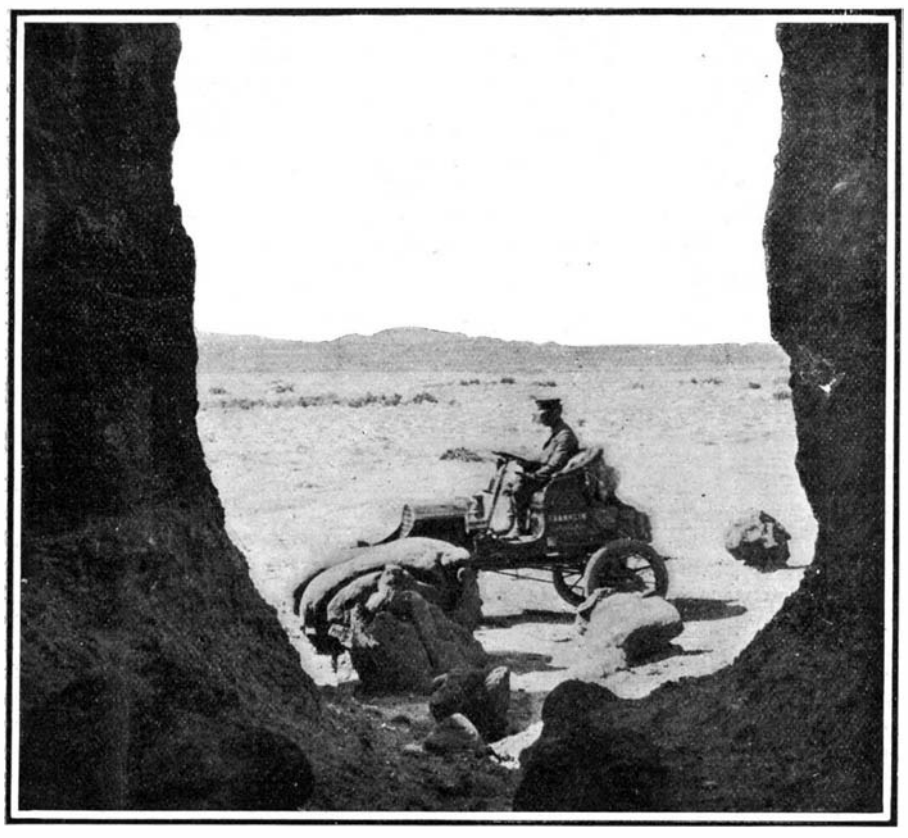
NEW YORK, JANUARY 13, 1906.

10 CENTS A COPY.
$3.00 A YEAR.

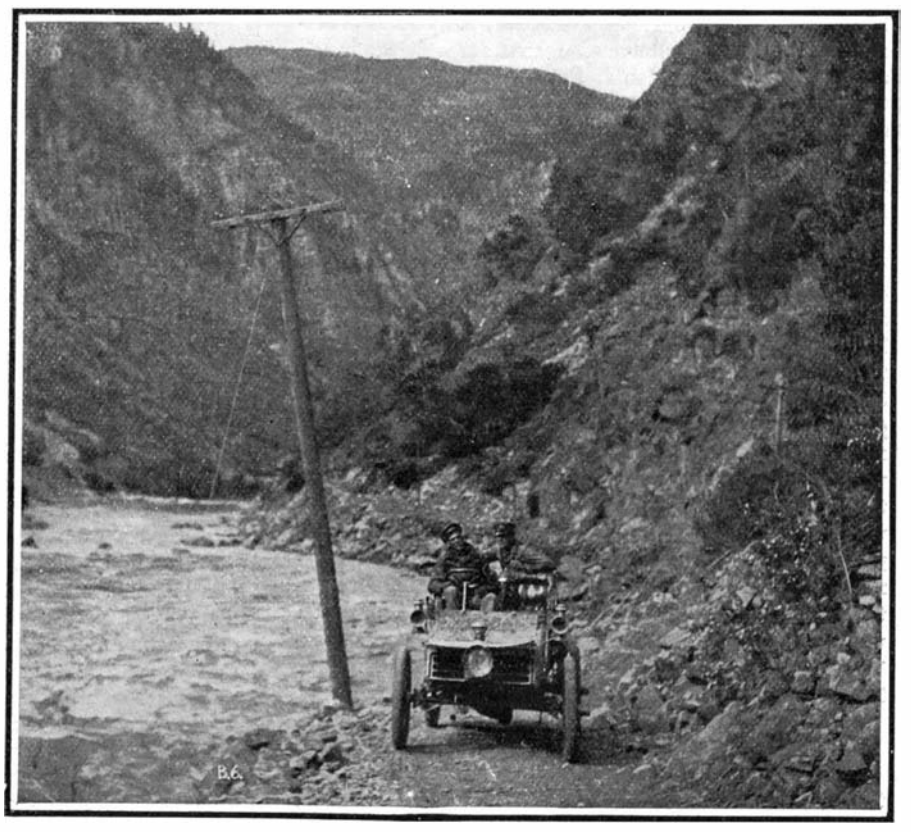
Water Toboganning in the West.



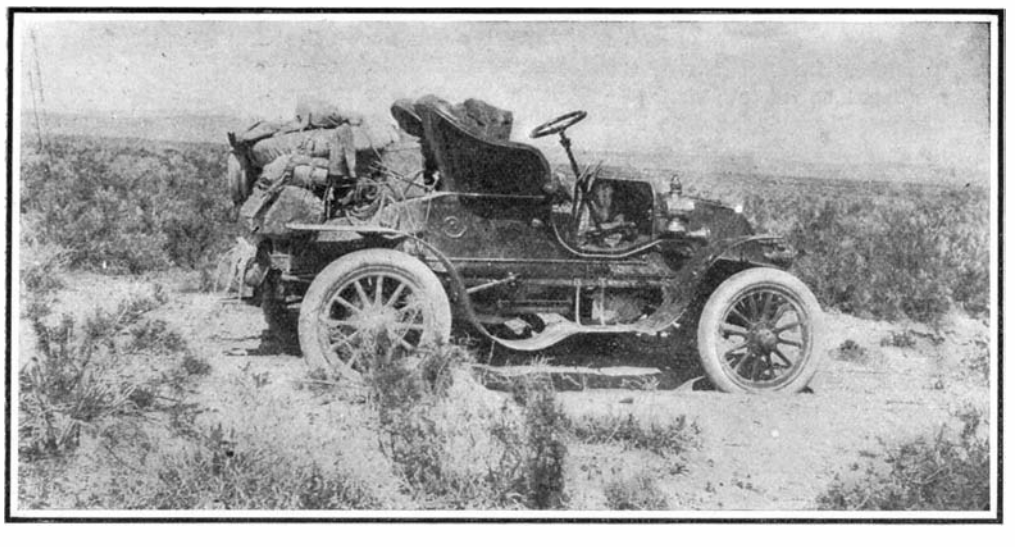
Reo "Mountaineer" Among the Hills and Sage Brush of Central Oregon.



The Air-Cooled Franklin Framed in the Walls of a Wyoming Canyon.



The Packard Proceeding Cautiously Through a Grand Western Gorge.



The First Car to Cross the Continent Resting in the Desert Sands.

The Winton Undergoing a Severe Tire Test.

TRYING EXPERIENCES DURING THE TRIPS OF CARS THAT HAVE CROSSED THE CONTINENT.—[See page 24.]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....$3.00 a year
Scientific American Supplement (Established 1876)..... 5.00 "
American Homes and Gardens..... 3.00 "
Scientific American Export Edition (Established 1878)..... 5.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JANUARY 13, 1906.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

FUTURE OF DIRECT-CURRENT TRACTION.

The controversy as to the relative merits of direct and alternating current traction, particularly with reference to steam railroads, shows no signs of abating. It was aroused by the fact that two great railroad systems which enter the same New York terminus, and use the same suburban and terminal tracks for a distance of several miles, are employing two different types of motor, one direct-current and the other single-phase alternating current. The controversy is wider than that of merely the two railroads concerned, for it includes the two largest electrical manufacturing concerns in the world; one the General Electric Company, which is furnishing the direct-current equipment, both for power stations, lines, and rolling stock; and the other the Westinghouse Company, which is furnishing the single-phase alternating equipment for the New Haven lines from Stamford to their junction with the New York Central system at Woodlawn. The alternating-current advocates have expressed surprise that such an important installation as that of the New York Central terminal lines should have been equipped with the direct current, arguing that it is approaching the stage at which it will not compare in economy, particularly for long-distance work, with the more convenient and flexible alternating current.

It is stoutly maintained by the direct-current advocates, that it has by no means reached its final stage of development, as proved by the fact that recently tests and results of 1,500-volt direct-current railway motors have become available, and that there are rumors of a 700-mile direct-current transmission. It is urged that 500 to 600 volts is merely a stepping stone to more efficient pressures, which are sure to be used. A correspondent of one of the contemporary journals devoted to street railways, claims that it is now practically possible to furnish reliable direct-current railway apparatus for a voltage of from 1,000 to 1,200 pressure; and that with proper designing of the magnetic circuit in the motors, and the placing and insulation of the controlling apparatus, there is no reason why the advantages of high voltage should not be realized under the direct-current system, as they now are in the alternating system.

DESIGNING THE STEAM TURBINE.

It is seldom that, in the development of a new art, the public is taken into the confidence of the designer, and treated to such a luminous exposition of the principles that govern both design and construction, as is given in a paper recently read by Mr. E. M. Speakman before the Institution of Engineers and Shipbuilders in Scotland, on the Dimensions of the Marine Steam Turbine. Although there have been many papers read on the general subject of the steam turbine, we doubt if there is any approaching this paper in the completeness of the ascertained data that it contains. In the nature of things, turbine design was, in the earlier stages, and in some respect is yet, largely empirical; and hence, results that have been established in the day-by-day working of the marine steam turbine are, just now, of extreme value. Limitations of space prevent us from giving this paper, which is published in full in the current issue of the SUPPLEMENT, more than a brief review in these columns.

Turbine efficiency and propeller efficiency must be considered separately, and also together, because it may be found that the use of revolutions somewhat below the maximum obtainable will increase the combined efficiency; while on the other hand to obtain certain advantages in weight and space, this efficiency may be slightly sacrificed at the highest speed. Roughly speaking, the weight of the turbines will vary inversely as the square of the revolutions. The minimum size of propeller required to avoid cavitation must be calculated at the beginning of any design, as it is almost impossible to assume certain revolutions, and later on to design a propeller to suit. Cavitation is partly the result of attempting to obtain too much work per square foot of blade area, and partly of excessive peripheral speed. It has been found by bitter experience that there is a narrow limit to the tensional pressure possible on the water, beyond which propeller efficiency drops very rapidly. This pressure is approximately from 10 pounds to 12 pounds per square inch at the depth of 12 inches below the surface. The speed of the tips of the blades of turbine-driven propeliers varies from the enormous velocity of 12,400 feet per minute in the British torpedo-boat destroyer "Viper" of 36 knots speed, whose screws were 3 feet 4 inches in diameter, down to 8,125 feet per minute on the "Carmania," whose screws are 14 feet in diameter. The percentage of slip has varied from 28 per cent in the "Viper" down to 14 per cent in the Channel steamship "Viking." In the large ocean-going vessels, the slip is from 16 to 20 per cent.

Although the laws governing the best velocity of steam and blades are similar to those for water turbines, some modification is necessary in practice, and the best ratio of blade speed to steam speed is still a matter of opinion. This ratio has varied in Parsons turbines from 0.25 to 0.85 of *Vs* where *Vt* represents blade velocity of mean diameter, and *Vs* steam speed due to expansion across the row in question. The steam consumption must be accurately known in order to proportion these ratios correctly. With these results before us, we are not surprised to hear Mr. Speakman say that the best blading arrangement, scientifically and commercially, is the result of much theory and practice, and that this data being based on long and costly experiments is naturally withheld from publication. With regard to speed of turbine blades, we are told that blade speed is governed to some extent by blade height; and that the speed should be so modified that this may be at least three per cent of the mean diameter to reduce the proportion of clearance losses.

Leakage over the tips of the blades is, perhaps, not so detrimental on account of actual leakage loss as in its superheating effect on the steam between the row past which it leaks and the last row, which seriously affects the fluid efficiency. That the turbine is not suited to slow vessels is due to the fact that the propeller controls the speed of revolution, and to the fact that there is a necessary proportion between the blade height and the diameter. In slow cargo steamers, though the revolutions may be high enough, the power required is not sufficient to enable a sufficient blade height to be adopted for the prevention of undue leakage. The ratio of blade height to mean diameter should not be less than 3 per cent or more than 15 per cent, because in the first case leakage will be excessive, and in the latter the bending moment on the blades becomes too great. The trouble with the stripping of the blades may be set down to bad workmanship, defective blade material, whipping of turbine spindles (due to bad design or bad balancing), and to excessive cylinder distortion due to temperature. This last is the most fruitful cause, and is a serious one, being due entirely to poor design. Great care must be taken in proportioning the cylinders; for under wide ranges of temperature, when the turbine is working there may be a fall from 400 deg. to 100 deg. F. in a distance of 6 or 8 feet. The radial expansion, therefore, is greater at one end than the other. Hence, ample clearance must be allowed. This clearance will vary from 3/16 of an inch for a 1-inch blade to ½ an inch for a 10-inch blade, and ¾ of an inch for a 30-inch blade.

Finally, on the question of the performance of turbines as compared with reciprocating engines for marine work, both the Admiralty and the British railroad companies that employ Channel steamers have been able to test similar ships under the same conditions and secure most reliable data. In the earlier trials of the cruiser "Amethyst," it was shown that only below 55 to 60 per cent of its full speed does the consumption of the turbine exceed that of the piston engines. In later trials of the "Amethyst," after the steam piping had been altered so as to permit the auxiliary exhaust steam to pass through the main low-pressure turbines, the low-speed consumption of the "Amethyst" was brought down below that of her sister ships for all speeds to 10 knots an hour, which is about 45 per cent of her full speed.

THE AUTOMOBILE IN 1906.

The annual automobile exhibition in New York city, for the year 1906, marks a distinct advance on its predecessors on every point of comparison. In respect of magnitude, it is sufficient to say that two of the largest buildings in this city are required to afford sufficient space for the exhibition of the automobiles and their accessories. In order to separate the exhibits into two distinct groups, the Licensed Association of Automobile Manufacturers confined their display to Madison Square Garden, showing only cars which are licensed under the Selden patent, while the Automobile Club of America houses its display in the handsome new armory of the Sixty-ninth Regiment, the entries in this show being confined strictly to cars that are unlicensed. Not only is the display far larger than any that has preceded it, but the buildings themselves have been decorated and arranged on a plan which renders the effect extremely handsome. Elsewhere in the present issue we have illustrated and described individual cars, that represent the present progress in the art of automobile manufacture; and it is, therefore, our purpose in the present article merely to outline what might be called the type touring car, as evolved during the past ten years of the development of the industry in the United States.

The standard car, then, at the opening of the year 1906, is a four-cylinder touring car of 24 to 28 horsepower, weighing from 2,000 to 2,200 pounds, or a 30 to 35 horse-power machine, weighing from 2,200 to 2,400 pounds. The four-cylinder motor is housed in a bonnet at the front, and the power is transmitted through a three-speed, sliding-gear transmission by shaft-drive and bevel gears to a live rear axle. The wheels are distinctly larger, being 32 to 34 inches in diameter, with large tires 4 or 4½ inches in diameter. Our standard car shows marked improvement in the arrangements for lubrication of the engines, a continuous circulation being secured by some form of mechanical forced-feed oiler, the oil passing through sight-feed glasses carried at the front of the machine on the dashboard. The familiar leather-lined cone-clutch has given place to a multiple-disk clutch, and as the disks run continually in oil, there is a certain amount of slip when the disks are first compressed, so that the clutch takes hold without jar or jerk. This renders it possible to start a car on the high speed from a standstill.

Although the majority of the cars still make use of cooling water and a centrifugal circulating pump, there is evidence that the air-cooled motor may ultimately become the prevailing type, even for the high-powered car. Two makers exhibit this year six-cylinder, air-cooled motors. They were encouraged to take this step by the good results that have been obtained by air-cooled motors in the various reliability and economy runs that have been held during the past year. Another make secures its cooling effects by permitting the cylinders themselves to revolve; but practically all of the others make use of fans, one of the few exceptions being that of a light four-cylinder runabout, one of which performed the feat of crossing the continent. There is no question that the air-cooled car has falsified the predictions of failure which have been made freely in the past; and the good results secured are to be attributed to a careful study of conditions and well-thought-out design. The powerful air-cooled car is distinctly an American production, and the fact that it has won its way to successful recognition among the higher-powered machines is a subject of congratulation to those who would like to see the United States contribute more fully than it yet has done to the development of the perfect automobile.

Although the four-cylinder, four-cycle motor is the standard type to-day, the two-cycle motor is making distinct progress. One of the oldest manufacturers in the United States has worked on the problem with such success that he has brought out a two-cylinder, 25-horse-power touring car which weighs only 1,700 pounds. If certain inherent disadvantages of the two-cycle motor, such as the small range of speed, and the difficulty of keeping the crankcase tight, can be overcome, there are certain manifest advantages, in the way of lighter weight and greater simplicity, that will tend to make this type a favorite. It is quite possible that the future motor will be of the two-cycle, four-cylinder, mechanically air-cooled type; such a motor, except for the air-cooling feature, is shown in the exhibition. That this type can work successfully in the larger sizes would seem to be proved by the fact that a western railroad, which has been very active in the introduction of gasoline motor cars on its system, has recently received a four-cylinder, air-cooled, two-cycle motor of 200 horse-power for one of its new cars. The abolition of the valves, the circulating water pump and radiator, and the reduction of weight per horse-power in the motor, would mark a decided step in advance in respect of the weight, cost, simplicity, and convenience of operation of the automobile.

But to return to our typical car; we note that it is fitted with spring-separated ball bearings in the transmission and the wheels, with the choice of roller bearings for the rear axle, wheels, and countershaft. Ball bearings have been in use now for two seasons, and may be considered as standard practice. We note that one car shows roller bearings on the ends of the engine crankshaft. The greater ease and smoothness of running are attributed to shock-absorbers, rebound-checking devices, and pneumatic tires of large diameter. Although our type car does not carry them, we observed that inventors have been busy endeavoring to find some device which will permit of the use of solid tires on the road wheels, without losing the shock-absorbing and high tractive efficiency of the pneumatic tire.

The standard car depends for ignition upon the jump spark, with high-tension magneto or storage battery; although we noted in the exhibit several

cases of low-tension magneto ignition. The valves are mechanically operated and are interchangeable, two sets being used, one on each side of the motor. The type car may carry either cellular radiators or those of the finned tube pattern, while some of the cars use flattened tubes provided with radiating fins. The type car carries two separate brakes, one of the expanding ring type, the other a band brake, acting within and on the outside of a drum on the rear wheel. The band brake, worked by a pedal, is for ordinary use, and the expanding ring brake, which is applied by the hand, is used for emergency. Finally, we note that the engine is controlled by separate spark and throttle levers, mounted on stationary sectors in the steering wheel.

It is a matter of congratulation that the industry has now grown to such proportions that the manufacturers are enabled to turn out a standard car which is at once superior in construction and lower in price.

PROGRESS WITH THE ELECTRIC AUTOMOBILE.

Although King Gasoline has gone on rapidly conquering the world, the beggar maid, Electricity, is soon coming to her own. She has been hard at work for the past several years doing more and more of the world's drudgery, and, according to present indications, she will yet have the honor of moving a considerable percentage of its pleasure vehicles as well.

The improvements that have been made in electric automobiles are of two kinds, namely, those in the vehicle and motor, and those in the battery. One class is quite as important as the other and the changes made during the last few years have been almost as great in the one as in the other. The result is that the modern electric vehicle for pleasure purposes can now be constructed to consume only about 50 watt-hours per ton mile at a speed of 15 miles an hour, where some years ago it used nearly three times as much; and reliable batteries delivering 15 to 18 watt-hours per pound can be had, as against the 8 or 9 watt-hours of usual practice. Thus it will be seen that vehicle and batteries have improved 100 per cent. That this is not merely theoretical improvement is seen from the fact that an electric stanhope having a guaranteed mileage of 85 on a charge, is now on the market, and larger, long-distance pleasure vehicles are being rapidly perfected. In France last fall several "raides electriques" were made to show what can now be done with ordinary stock vehicles. The most notable of these was the run from Paris to Trouville (about 130 miles) on one charge. Even more worthy of notice was a trip in this country from Cleveland to Erie (100 miles) over ordinary country roads some of which were sandy and which included several steep hills. A trip such as this on one charge makes the possibility of the practical electric touring car seem within grasp. With the high-capacity batteries and the improved motors and methods of power-transmission, the discharge rate of the battery is lowered with respect to the capacity, which results in lengthened life, so that a year of service can be assured before the replacement of the positive plates becomes necessary. A set of negative plates will usually outlast two sets of positives, and the upkeep of the battery can usually be placed at a fixed sum per annum.

Regarding types of storage battery other than the lead-lead type, there has been no great advancement of late. The lead-zinc battery, if ever perfected, will doubtless be the ideal battery, as the light weight of such a battery (25 watt hours per pound) coupled with its high voltage (2.5 volts) and heavy rate of discharge possible make it just what is needed for automobile work. The Edison battery is practically perfect in the last-named respect, as a heavy discharge does not affect the capacity. Bulk-for-bulk, too, the Edison battery is lighter than those of the lead type. Its low voltage (1.25 volts), however, makes more cells necessary, and it suffers such a serious loss of capacity under the effect of cold as to make it impractical. The results of an interesting series of tests of this battery by a well-known foreign electrochemist were published recently in the SUPPLEMENT. Despite the defect mentioned, this expert believes that batteries of the Edison, or nickel-iron, type will in a few years drive the lead battery from the field.

The method of power transmission found to be the most efficient is a single motor with individual chain drive from a countershaft to the rear wheels. On heavy vehicles two motors are generally used, but the chain drive replaces the old-time spur gear. With two motors the battery cells can always be connected in series, and none can be discharged more than others. But if a connection breaks the vehicle is stalled until a repair is effected. The low-voltage battery (12 to 24 cells) is largely used for light vehicles and even some of the largest machines are now so equipped. Its advantage is a smaller number of cells; its disadvantage, inefficiency in charging from 110-volt circuits, as energy is lost through a rheostat.

In the business and commercial vehicle line, for city work, the electric still reigns supreme. Hansom cabs, coupés, delivery wagons, and trucks are daily increasing in numbers. Besides their readiness in all weathers they do not emit smoke or the odor of half-burned gasoline—a nuisance that has become so great as to be the subject of legislation and police interference in London. The speed of the passenger-carrying electrics is as great as that of the corresponding gasoline car for city work, and they have all the advantages, without the liability to breakdown of the latter.

Among novelties in the electric vehicle line may be mentioned an electric tractor, or fore-carriage, which can be used with various bodies, and a trolley arrangement by which an electric automobile can be run by current from the street railway trolley wire, and at the same time recharge the batteries, when following the track.

INCREASING DEMAND FOR THE MISSISSIPPI PEARL.

BY K. L. SMITH.

If the truth were known about many of the pearls that we see nowadays, we would discover that a fair share of them, even among the expensive ones, came from the Mississippi River or its tributaries. Pearl hunting in these localities has become an established business, and regular pearl prospectors are examining rivers and creeks, with a view to locating beds of mollusks that may contain valuables. Attention to the rare pearls to be found in these streams was first called about twenty years ago, when large numbers of pearl-producing mollusks were found in a small creek in Dane County, Wisconsin. The farmers began searching the beds of streams with such success that thousands of pink, purple, and blue-tinted treasures were sold, bringing in a profit of many thousands of dollars. The excitement that prevailed at that time gradually died down, but enthusiasm has broken out again in localities bordering on the Mississippi.

There is a fascination about the business that smacks strongly of speculation, for a man may find any time a gem that may mean a fortune. The men who live this outdoor life are rugged and healthy, and each carries a tin box, which in one season may become the receptacle for holding thousands of dollars' worth of large and small pearls. The pearl hunters have learned to be experts in valuing their finds, and few gems sell at small prices. Generally they are sent East to lapidaries to be valued, and they are sold at once, for the pearl hunter knows that he does well to avoid the "middleman," who is sent out by eastern firms to gather the "finds." Some pearls are sold for a thousand dollars, and a necklace twenty-eight inches in length, made of small Mississippi pearls for the great singer Nordica, who desired a souvenir of Minneapolis, cost two thousand dollars.

Pearl hunting is an exact science, and the successful hunters are skilled in the business. Usually the prospector has a boat, which he allows to drift with the tide. Behind this is fastened a long pole, to which is attached hundreds of lines with bait on the ends. The mollusks close their mouths over these with tenacity, and as they are hauled in as soon as the lines are filled, many bushels are obtained daily. This is the easiest part of the process. The next operation is to open them, which if done with an oyster knife is so laborious it lives long in the memory of the novice. On this account most prospectors either steam the mollusks over a mild fire, or spread them out in the sun to slowly dry, when the two parts of the shell separate readily. The exciting moment comes when the contents of the shell is divulged, for much or nothing hangs on the revelation.

In fact, this insignificant-looking, dirty clam that may contain a treasure of value is an object of interest in itself. Content to lie in almost any kind of water, living on animalcules, very prolific, and a pearl producer, he travels slowly back and forth from mid-stream to shore unless he is gobbled up by the muskrat, who loves him dearly and eats him, pearl and all. The pearls are always near the shells, and can be squeezed out of the meat, with the fingers. Sometimes they are found loose in the shell, and at other times they are attached to it. If loose, the chances are that they may fall out, and good pearl hunters on this account search the bed of the stream, and even dig up the dirt to see what will "pan out."

In the early days of the industry, the slugs or small pearls were thrown away, but now they are kept and sold by the ounce or separately. These are always in the meat, and sell from two to five dollars. New processes in setting jewelry have made them in demand. Contrary to general belief, the expensive pearls are not always round or oblong in shape. Many fine specimens are "baroques," that is, they assume grotesque forms, a fact that can be accounted for by their origin, for scientists tell us that a pearl is really a malformation caused by some foreign substance finding entrance to the shell, and irritating the mollusk to such an extent that he exudes a liquid, which hardens and eventually becomes a precious pearl.

The prospector moves from one part of the stream to the other as soon as one mollusk bed is devastated. Some beds seem to contain more pearls than others, but it is the size and thickness of the pearl that make it invaluable for some articles of jewelry, and lapidaries in our large cities are using them freely. If any criticism is to be made, it is that they lack the yellow tint of the Oriental product. Many sell for high prices, however, and the black pearls which are occasionally found are exquisite.

To the casual observer, pearl hunting seems the easiest way in the world to earn a living, but it must be remembered that not one in fifty of the right species contains a pearl, and many mollusks are so light colored that they are known to be valueless, and are thrown away without being opened. It is a hit-and-miss sort of business, into which many start. Those that remain to the end get a good living, and every summer finds so many engaged in the work, that pearl hunting has become one of the established means of livelihood in the Mississippi Valley.

SCIENCE NOTES.

In a paper presented to the German Physical Society, F. Meyer treats of the permeability of argon for the ultra-violet rays. He uses an apparatus which is the same as he employs for ozone researches and is on the same plan as the photo-electric photometer devised by H. Kreussler. A glass tube 8 inches long and 2 inches in diameter, closed at the ends by quartz plates, is used as an absorption tube. After filling the tube with a mixture of argon and nitrogen, the author measures the extinction of the radiation by alternately inserting or removing the gas tube. The results he obtains show that argon is quite free from appreciable absorption for ultra-violet rays between $\lambda = 186$ and 300. In any case the absorption does not exceed 3.2 per cent under the conditions of the experiment. As the ordinary air contains about 1 per cent of argon, the latter cannot play any important part in the absorption of the sun's rays having short wave-lengths. Accordingly, we must abandon Hartley's hypothesis, which holds that the substance contained in the air and to which is due the sudden ending of the solar specter for $\lambda = 293$ is identical with argon.

A new process brought out in France relates to the preparation of a derivative of castor oil which can be mixed with the mineral oils. A product of this kind has been already obtained by distilling castor oil up to the point where it loses a determined weight, and stopping the distillation before a product of gelatinous appearance is separated out. The present process, which avoids the losses coming from the distillation and also suppresses the disadvantages which are well known in connection with the dry distillation of oils, consists in heating under pressure the oil to be treated. To carry this out the oil is heated under a certain pressure in a tight boiler until it becomes capable of mixing in all proportions with the mineral oil. It is recognized that the best results are obtained with a temperature of 260 to 300 degrees and a pressure of 4 atmospheres by keeping up the heating for some ten hours. Then the boiler is left to cool completely before it is opened. The product which is thus obtained can be mixed directly with the mineral oils. Observations which have been made up to the present also show that by operating in a closed vessel we avoid all danger of forming a gummy product from the castor oil.

L. Sindet, of Paris, finds that certain metals such as copper when placed under constantly aerated water in the presence of iron act to increase the oxidation of the latter, and that others like tin, lead, zinc, aluminium, and magnesium keep back the rusting of the iron just as alkaline carbonates do. Among the bodies which prevent the rusting of iron, arsenic holds the first place with its compounds. In presence of aerated water they furnish arsenious acid and perhaps sub-oxide of arsenic As_2O_3. Using arsenic in large quantities sometimes the oxidation of the iron is entirely stopped, or again it is only slowed up. Arsenic acid, arsenites, and the alkaline arsenites at 1 per cent strength completely stop the rusting. Orpiment (sulphide of arsenic) gives also a strong effect. Wishing to apply his researches to the study of the causes of rusting of tinned or galvanized iron cans which are used to carry denatured alcohol, he finds that the carbureted alcohols containing 50 per cent of light benzine have a great activity in the production of rust. Benzine having an equal volume of alcohol added to it appears to triple the speed of rusting. Aldehyde, ethyl or methyl acetate do not provoke the oxidation, but they attack the zinc, the tin, then the iron of the vessels, and it is the acetates of zinc, tin, or iron from the decomposition which begin the rusting of the iron, especially in the presence of benzine. Although arsenic, etc., totally stop the oxidation, and this during several months of contact, it is evident that we could not use them here, seeing that even though the alcohol dissolves but traces of arsenic, the latter is oxidized in the liquid and the products of the oxidation are more solid than the arsenic itself. He was able, however, to give a steel sheet a surface cementation by arsenic and it did not rust, while a non-treated sheet exposed at the same time to moist air became entirely covered with rust.

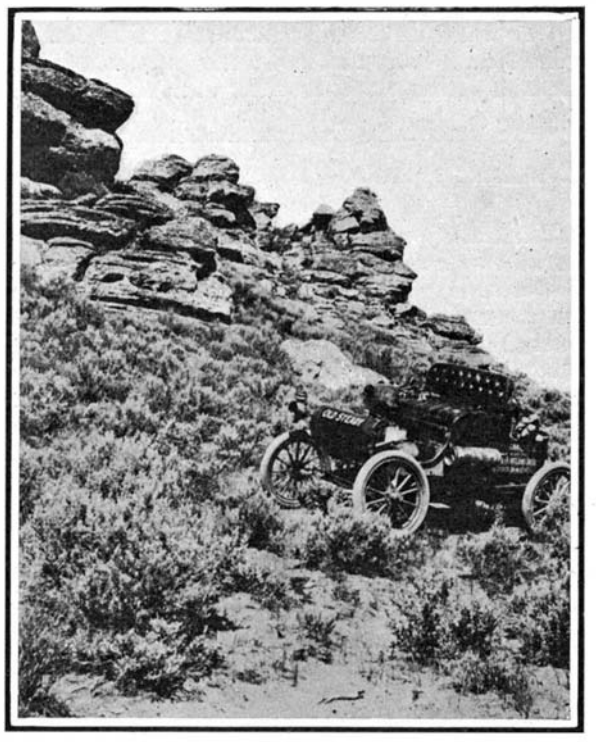
CROSSING THE CONTINENT BY AUTOMOBILE.

There can be no question that the idea of a transcontinental automobile trip was considered by motorists almost as soon as this sport began to assume its prominent position in America. Apparently the first serious attempt which has been recorded was that made by Alexander Winton and Charles Shanks in a Winton car in 1901. This expedition ended unsuccessfully, for after the Sierras had been overcome with difficulty, the sands of the Great American Desert were found to present an unsurmountable obstacle. It was not until 1903 that the continent was actually traversed from ocean to ocean in a motor car. The first successful machine was a Winton touring car carrying Dr. H. Nelson Jackson and Sewall K. Crocker, a professional chauffeur. In this year no less than three parties were able to perform the journey, the other two trips being made in a Packard car and an Oldsmobile runabout, respectively.

Dr. Jackson and Crocker left San Francisco on May 23, in a double-opposed-cylinder touring car of 20 horse-power. The route from San Francisco lay northward along the Sacramento to Redding at the upper end of the valley and thence into lower Oregon, striking boldly across that State and then along a course over the Rockies entirely off the line of all railroads and one that fairly bristled with difficulties. The most annoying troubles were often the minor ones; for not only were these very frequent, but they were of great diversity as well. At only one place did the travelers run out of gasoline, and on this occasion the unhappy Crocker walked 29 miles to procure a fresh supply. At one time they were without food for thirty-six hours and were indebted to a lone but friendly sheep herder for a generous meal. A block and tackle with which the travelers had provided themselves proved invaluable in rescuing the machine from sand, mud, or streams which had been "rushed" unsuccessfully. The steep, rough, and bowlder-strewn grades were overcome one after the other, though the narrowness of the roads, or rather trails, necessitated the most careful driving. A very difficult portion of the journey was that between Redding and Pocatello, Idaho. At Caldwell, in that State, a third person was added to the party in the shape of "Bud," a bulldog, who soon became an expert autoist and a pleasant companion.

As was repeatedly found in later trips in the West, the deeply worn ruts of many of the roads gave almost as much trouble to the low-built cars as the sands. Frequent stallings in mountain streams were no unusual occurrences, but, on the whole, fairly good time was made in crossing the mountains, notwithstanding the loss of a set of ball-bearings from a front wheel with subsequent inefficient repairs by a wayside blacksmith. Travel through the "Bad Lands" was rough in the extreme, as the roads, almost impassable originally, had been rendered still worse by recent cloudbursts. The hardest climb was over Elk Mountain in Wyoming. The stretch through Laramie and Cheyenne, clear across the great plains to the Mississippi, was monotonous, but not very troublesome. From Omaha to Chicago, following the general line of the Chicago and Northwestern Railway, and thence through Cleveland, Buffalo, and Albany, to New York, the journeying was good, and was accomplished pleasantly and without much difficulty. So, on July 26, 1903, with the arrival at the great eastern metropolis, was completed the first automobile journey across the American continent, thus adding one more to the number of the expeditions, beginning with the ox-wain and the mule-team, which started nearly a century ago.

Of the three transcontinental trips made in 1903, the journey of the 12-horse-power, single-cylinder Packard, with E. T. Fetch as driver and M. C. Krarup as observer, was the most direct and central between San Francisco and Denver, through California, Nevada, and



"Old Steady" in the Bad Lands.

Utah. The start was made on June 20, and the journey was completed on August 21, in a wild night drive into New York city. The entire time on the road was 62 days, including a four-day stop at Denver for rest and necessary repairs. The car was of the regular stock type, and with two people aboard weighed nearly 3,000 pounds. Despite the severe strain to which the mechanism was constantly subjected, the interruptions due to breakdowns were trivial. The course, east of Denver, lay through Omaha, Chicago, Cleveland, Buffalo, and Albany.

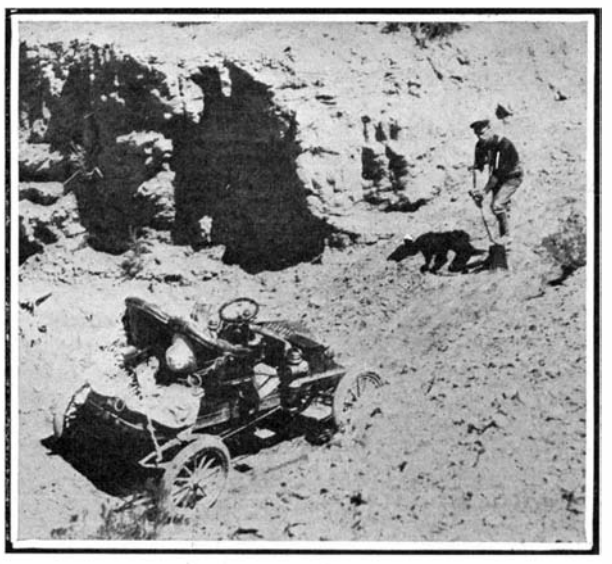
Crossing the Sierras from Placerville was often exciting, particularly the descent from the summit of the divide to Lake Tahoe, about 8,000 feet below, where at one point the machine descended 800 feet in two miles, practically sliding that distance in 9½ minutes under brakes. The troublesome sand in Nevada was successfully combated by using two 24-foot strips of canvas to give traction in the worst places. The alkali marl and innumerable washes encountered in the 300-mile stretch across the Humboldt Valley taxed the endurance of the car and travelers to the utmost. Even more annoying were the ravines and gulches of the desert, and here further trouble was caused by the depth of the ruts, the higher middle portions of the road frequently lifting the wheels of the low-built car clear off the ground. The tough sage brush not only whipped off the canvas under the engine, and the paint from the car body, but completely wore away, as well, the tough wooden handle of a shovel strapped underneath. The steep sides of many ravines were climbed by "jumping" the car by fly-wheel momentum. The worst stretch of rocky, tortuous, and bowlder-strewn road was encountered in Soldiers' Canyon, Utah.

The hardest portion of the trip was over when Denver was reached, though beyond that city barbed-wire cattle fences and irrigation ditches were often annoying. Through parts of Nebraska and Iowa the muddy condition of the roads made the travel almost amphibious, but through Illinois to Chicago, the conditions were excellent. From that city to New York, little trouble was found beyond occasional muddy stretches, and during this part of the trip a good daily average was maintained.

The third journey of the year, the remarkable trip in the little single-cylinder Oldsmobile, was made by L. L. Whitman and E. L. Hammond, who left San Francisco on July 6, bearing a letter from Mayor Schmitz of that city to Mayor Low of New York. The machine was of the regular 5-horse-power runabout type, and carried, besides the occupants, only the most necessary articles. The road lay through Sacramento, Placerville, and Carson City to Reno, and was followed in a leisurely manner, no attempt at record time being made. Ogden, Utah, was reached after a hard struggle with the Great Desert of Nevada, which entailed considerable suffering from the alkali dust. During runs, which would last entire days, nothing was to be seen but sand and sage brush, but a two days' rest at Ogden thoroughly refreshed the travelers. On several occasions the trail of the Packard party was noticed in the desert sands.

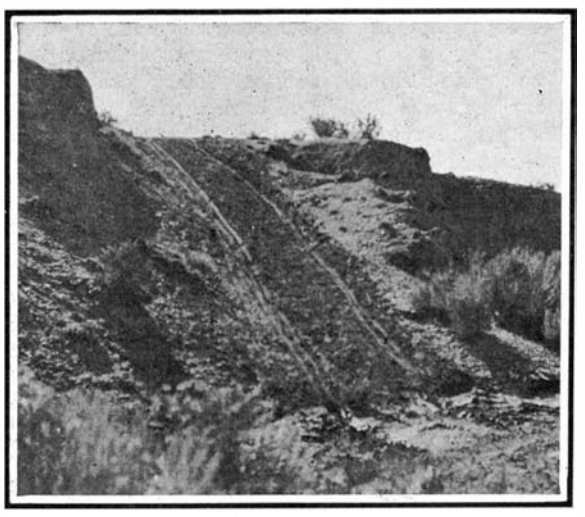
The trip to Denver from Reno lasted eight days, following the line of the Union Pacific Railway through Wyoming. This portion of the route was extremely difficult and after passing through Webber Canyon the terrible roads, rocks, washes, and alternate adobe mud and sand gave a great deal of trouble. Some good roads were found over the Laramie plains, but otherwise it was almost necessary, at times, to make the road. The Rockies were crossed amid clouds and rain, and to Omaha the journey was enlivened by continuous rains and seas of mud. A nine-day wait at that city for better weather conditions proved to be of advantage, for with drier roads, the 600-mile run to Chicago was made in four days. The mud was still bad, however, and the season seems to have been one of exceptionally heavy rains. From Detroit to New York the conditions for travel were far better, and in one afternoon 125 miles were covered. The city and the Atlantic were reached on September 17, after days and weeks of untiring effort. The travelers were enthusiastic about the machine, which was found to have stood the grueling journey splendidly.

The transcontinental



Preparing the Way for the Franklin to Climb Out of a Canyon in Wyoming.

Looking Over the Packard in the Desert Near Winnemuca, Nevada.



A 50 Per Cent Grade 100 Feet Long.

Navigating Through Iowa Mud.

INCIDENTS AND SAMPLES OF ROAD EXPERIENCED IN A TRIP OVERLAND ACROSS THE CONTINENT

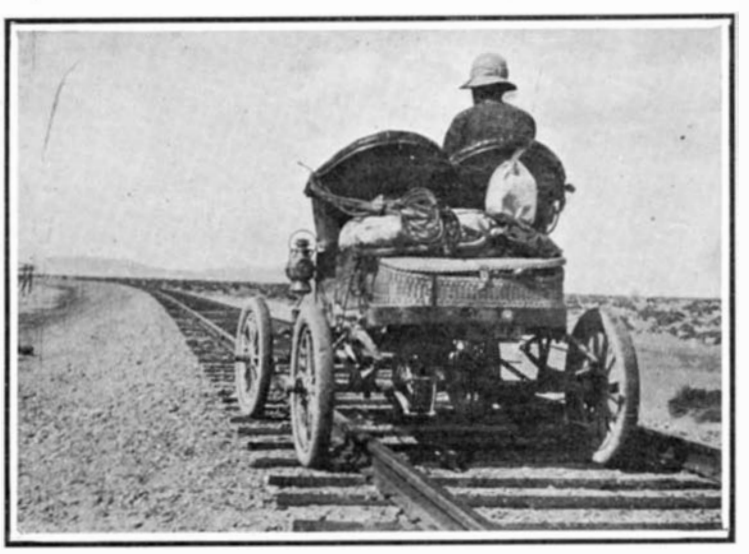
trip accomplished by L. L. Whitman and C. S. Carris, in a 10-horse-power Franklin car, in 1904, was remarkable in several ways, primarily as this was the first

A Western Hostelry, Cottonwood Ranch, Idaho.

The Reo Experimenting. A Combination of Sand and Snow in Central Oregon.

air-cooled car to perform this arduous journey, and as the entire time between start and finish was less than 33 days, cutting the previous record of 61 days nearly in half. The start was made from San Francisco on August 1, in a regular four-cylinder stock car, and on September 3 the wayfarers entered New York city, having made the excellent daily average of 155 miles, the highest day's run being 325 miles. The entire journey was performed without serious accident of any kind, and at the finish the machine barely showed even the slightest evidence of the numerous hard knocks and the unmerciful driving it had undergone. The most difficult portion of the trip, naturally, was that which included the crossing of the Sierras, the Rockies, and the deserts. The Sierras were crossed through Emigrant Gap, from Colfax to Reno, and here the roads were terrible. At one point a descent of 1,200 feet in one mile was accomplished. From Reno through Utah the roads were almost a negative quantity, and the deep sand, canyons, and gulleys gave the travelers a hard time of it. The performance of the air-cooled motor in the blazing heat of the desert was splendid, 600 miles of this Sahara being crossed in seven days. Through Wyoming the course followed the Northern Pacific Railroad, and was difficult in the extreme. At one place, while running at full speed, the rear axle of the car struck a concealed sawed-off telegraph post, and this resulted in a dead stop, which precipitated the occupants of the car over the dashboard. Strangely enough, the only damage caused by this accident was a bent truss rod. Good roads were found across the Laramie plains, and the descent through the Rockies was safely concluded. Good weather permitted record speed to Omaha, and from there to the Atlantic the conditions were excellent, so that this portion of the trip was a mere pleasure jaunt.

The Packard Ready for the Mountains or the Desert.



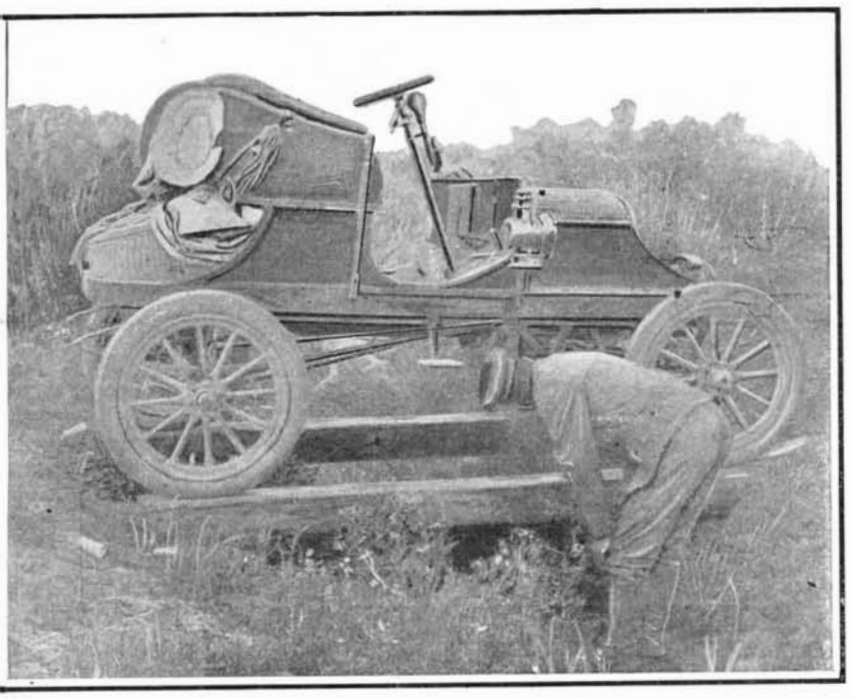
Rough But the Last Resort in Nevada.

An interesting tour was that of the two Oldsmobile runabouts from New York to the Lewis and Clark Exposition last summer, for not only was the journey made by a partly new transcontinental route, but the two machines were racing for a prize of $1,000 besides. "Old Scout," driven by Dwight D. Huss and Milford Wigle, reached the goal first, June 21, followed just one week later by P. F. Megargel and Barton Stanchfield, in "Old Steady." The cars, which were of the ordinary runabout type, left New York May 8, and remained in company until Omaha was reached. Two weeks' rain had made the roads across Illinois, Iowa, and Nebraska almost impassable, and the cars were forced along through the mud under great difficulties. The distance from Omaha through Cheyenne to Laramie was safely accomplished, but the journey from there to Boise, Idaho, appears to have been more of an athletic contest than a road race, as to begin with the roads were usually conspicuous by their absence, or, if present, almost beyond description. Through Idaho and Oregon they encountered the best roads west of Chicago, though there was some thrilling traveling across the Cascades. The time of the winning car was 44 days, 40 days being the actual running time.

The first round trip from ocean to ocean and return ever attempted was that undertaken by Percy F. Megargel and David Fassett, who left New York in the 16-horse-power double-opposed cylinder Reo touring car "Mountaineer," on Saturday, August 19, 1905. The Atlantic-to-Pacific portion of the trip has been successfully concluded, and the travelers are now on the return journey from San Francisco.

From New York westward to Wyoming the journeying was under excellent conditions, and 100 miles a day was easily covered. Crossing Wyoming the sand was often bad, especially in the Red Desert, and sand tires with which the "Mountaineer" was provided were very useful. The deep snow and terrific gales of the Rockies made the six days' travel over the mountains extremely dangerous, while at Bitter Creek a four days' delay was caused by an 8-foot rise of the water after heavy rain. Despite the hard going from Cheyenne the party reached Portland safely on November 10. At the present writing the tourists are nearing Albuquerque, New Mexico, on the southern return trip from San Francisco. This part of the trip has been far more thrilling and difficult than that to Portland. Coming over the Cajon Pass in California, the travelers had a very narrow escape when the car, skidding on a sandy road, turned over completely and rolled down a steep embankment though strangely enough, without material damage to mechanism or passengers. The trip across the Great Desert was enlivened by a fierce sand storm. In the Arizona Mountains the snow was very troublesome, and near Flagstaff the travelers nearly perished in a terrible storm, being without food and gasoline for 36 hours. They were

An Unfortunate Investment in Illinois Real Estate.



Temporary Bridge of Railroad Ties Near Bitter Creek, Wyoming.

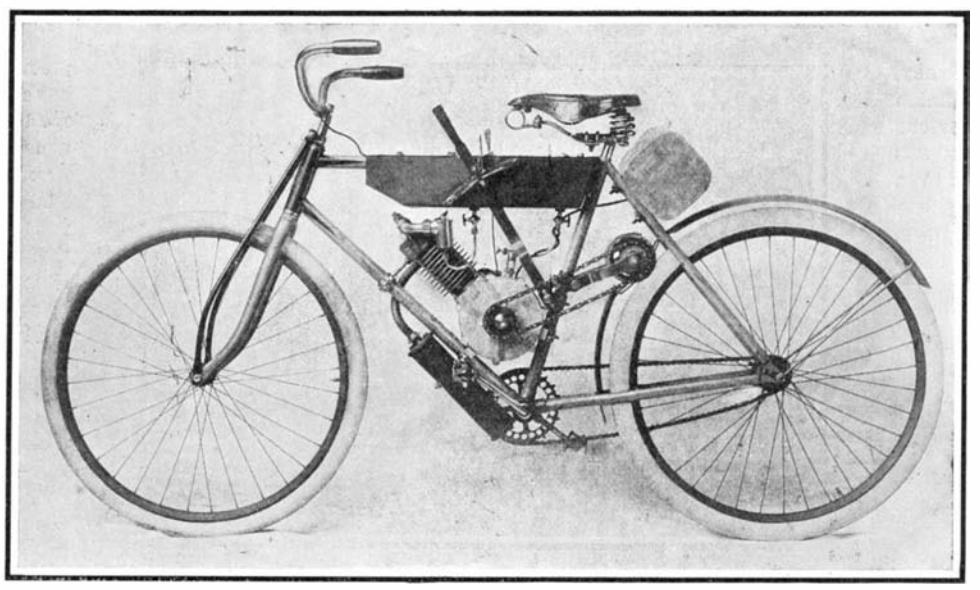
CROSSING THE CONTINENT BY AUTOMOBILE.

rescued by a search party seeking a lost ranchman, whose body was later found within a mile of the Reo-ites' camp.

The brief summary given above of cars which have crossed the continent would not be complete without mention of the trip made in 1904 by Mr. Charles T. Glidden in his English Napier. This machine ran to St. Louis in the tour to the Exposition, and thence to Minneapolis, Minn., where flanged wheels were placed upon it, and it completed the trip to the coast on the railroad track. For pleasure purposes this method of making the trip would seem to be ideal. But from a sporting and machine-racking point of view, the journey as accomplished by the six American cars was immeasurably superior. The record-holder, the air-cooled Franklin, is the only car fitted with a four-cylinder vertical motor, as well as the only air-cooled automobile that has ever made the trip. The other machines, also, are all of typical American construction, having horizontal single- and double-opposed-cylinder engines. Of the six successful cars, four are light runabouts, and three of these are of the same make. The American light car has thus proved itself the stanchest and most speedy of machines in a test such as has never been undertaken by European makers. Not only this, but the trip has also been made twice by motorcyclists—first in 1903 by George A. Wyman on a Yale-California machine, and second, last fall by W. C. Chadeayne on a Thomas Auto-Bi. The time of the former was 48½ days, and that of the latter 47 days, 11 hours, and 35 minutes.

A MOTOR EQUIPMENT FOR BICYCLES.

Our illustration shows a compact power outfit for converting an ordinary bicycle into a motor-driven machine. This outfit can be readily attached by anyone with the aid of a few ordinary tools, as all the parts are clamped to the frame with bolts and nuts, and there is no brazing or soldering required. As can be seen from the cut, the motor drives, by means of a chain, a rubber-covered friction wheel placed in the rear triangle of the diamond frame, directly over the bicycle wheel. This friction wheel is carried in a fork pivoted upon the vertical post, and adapted to be pressed against the tire by means of the long lever shown in front of the seat. The machine is started with the friction wheel raised, and when the rider has it fully under way, he can throw in the friction, start the motor, and proceed under its power. In coasting or when riding in a crowded street, the motor can be stopped and the friction wheel raised. This is a very advantageous arrangement, as it is not necessary to run the motor except when it is in use. The whole outfit weighs but 45 pounds, and, with a 2-horse-power motor, the machine will carry its rider about 30 miles an hour.



A 2-HORSE-POWER MOTOR WITH FRICTION DRIVE FOR CONVERTING AN ORDINARY BICYCLE INTO A POWER-DRIVEN MACHINE.

A LIGHT FOUR-PASSENGER RUNABOUT.

The single-cylinder runabout with a box behind which opens and forms an extra seat, is one of the new light cars for 1906. In our illustration, Mr. R. E. Olds, the inventor, is shown at the wheel. This car is fitted with a 4¾ x 6 engine, two speed, planetary transmission, and inclosed expanding ring brakes on the rear wheels. It is an extremely powerful little machine, capable of carrying four people 25 miles in an hour with a consumption of but one gallon of gasoline. The chassis resembles closely that of the Reo touring car, which has two 4¾ x 6 cylinders. The layout and construction of both cars is the same. The positive drive of the water pump directly from the engine crankshaft is a commendable feature, as is also the covering of the valve stems and springs with sheet-metal protectors to keep out dirt. The engine and transmission are mounted on a separate frame which is fastened in place on the main frame. The valves and spark plugs are in chambers placed above the cylinders and thus out of the way of oil. Individual carbureters and spark coils are used on the touring car, which is also fitted with a mechanical oiler. The Reo "Mountaineer"—the car which has crossed the continent and is expected back in time for the automobile show—is one of the regular double-opposed cylinder touring cars. The Reo Company also makes a coupé on this same chassis, besides a new light four-cylinder touring car having three-speed transmission, shaft drive, a new type of universal joint, illustrated on page 38, and other interesting features.

A LIGHT AND SPEEDY RUNABOUT.

The light-weight runabout shown below is the new 10-horse-power Maxwell car intended for light and high-speed work. This machine is fitted with the usual double-opposed-cylinder Maxwell motor, placed crosswise beneath the bonnet and having a two-speed planetary transmission in the same case with the cranks of the motor, which makes it impossible for any of the movable parts to get out of line. The motor, which is a 4½ x 5, has been considerably improved over that used last year. The heads and valves are water-cooled, which enables a higher compression to be used. The transmission is fitted with a multiple disk clutch and runs in oil. The same automatic compression oiler is used as was employed last year on the Maxwell cars, and the rear axle and bevel gear drive are also identical. The propeller shaft has two universal joints, packed in grease. The rear axle is mounted on roller bearings. The side thrust of the bevel driving pinion is taken up by a blank roller of the same size as the driving pinion, and which is fitted against the smooth bevel face of the drive gear so as to hold the latter in position. The car is provided with a steel body and pressed steel frame. Its official record of a mile in 1:18 is an indication of what may be expected of it in the way of speed on the level.

The Maxwell-Briscoe Company is another firm to this year bring out a new 4-cylinder 32-40 horse-power touring car. Besides this car, the company also makes a truck and a Limousine body car. The double-opposed-cylinder touring car and runabout, which were so successful last year, will also still be manufactured. The company now has three factories, and is turning out eight different models.

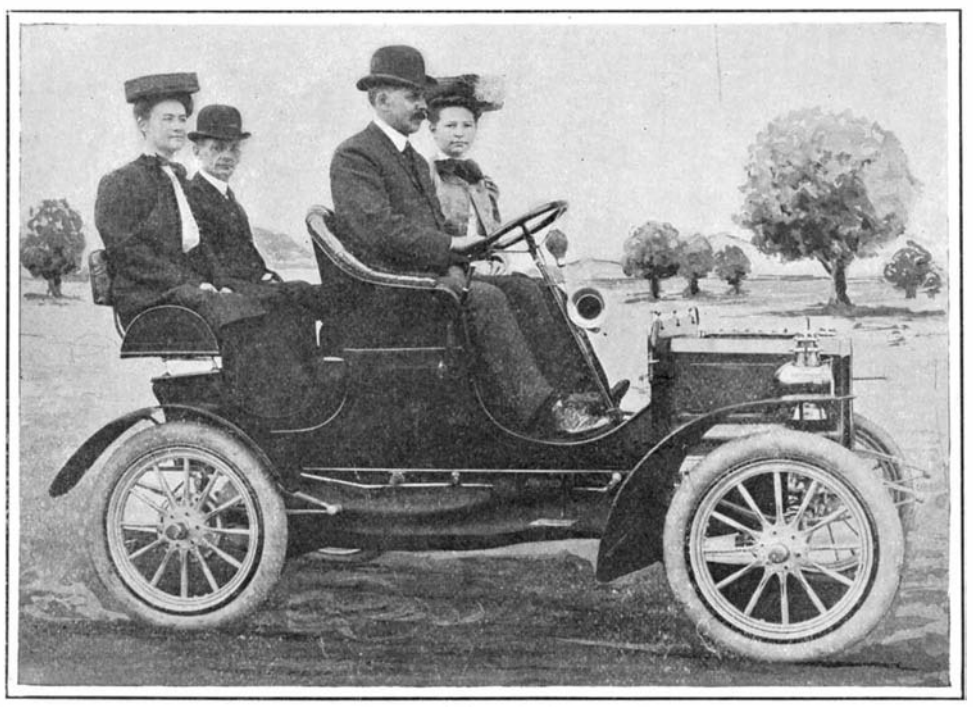
A Motor House Boat.

A luxurious motor house boat is in course of construction for the Marquis de Dion, who is so closely identified with the internal combustion engine of that name. The craft is 124 feet in length, with a beam of 16 feet 6 inches and of shallow draft. The boat will be provided with a sitting and sleeping compartment combined, a dining saloon 20 feet long by 15 feet broad, bedrooms, bathrooms, kitchen, captain's apartment, and quarters for the crew. With this motor water villa the owner intends to tour the various waterways and canals of France, accompanied by automobiles, with which he can indulge in land excursions when he so desires. Later the boat will wend its way through France to Marseilles, and thence round the coast to Monaco, where the owner will winter. The vessel will have a speed varying from eight to nine miles per hour.

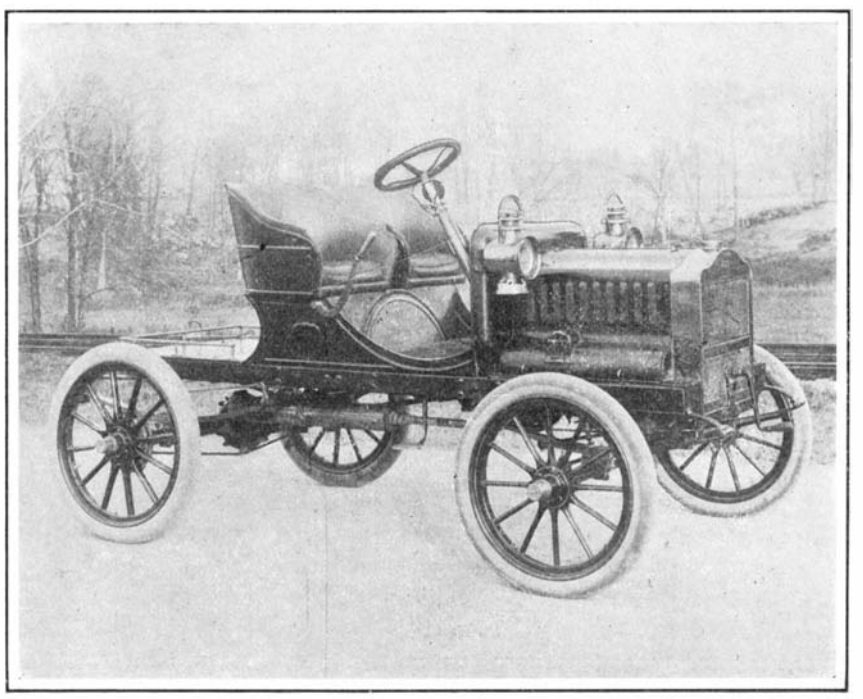
One of the most important moves in automobile building has been made by the American Locomotive Company. It involves the manufacture of the Berliet car in America, on the same plans and designs as are followed in the factory in France.

French workmen in Lyons and American workmen in the United States, working simultaneously, but three thousand miles apart, in the production of automobiles, the parts of which will interchange across the ocean, is a manufacturing accomplishment worthy of note. The French and American workmen might be standing side by side, so closely and exactly do they follow the same standards, templates, patterns, and gages. This is done in the construction of the Berliet car, so that an American-built car may be taken for a tour in Europe, or a Lyons-built car may be brought over for a tour in this country, and repair parts which are sure to fit are available nearby in either case. This will avoid months of such delays as are very familiar to the users of foreign-built cars. This is rendered possible by the use of the metric system and by maintaining the strictest conformity to standards, patterns, and gages and the closest adherence to specifications for material.

A new station for wireless telegraphy, according to the Neue Freie Presse, is being installed at Norddeich, in Germany, on the North Sea. The area covered by its operations will have a radius of over 900 miles, and will include Germany, Austria, Switzerland, France, Great Britain, and Denmark, as well as the greater part of Italy, Sweden, and Norway, and portions of Spain, the Balkan peninsula, and Russia. The station is being equipped with the Telefunken system.



THE NEW 8-HORSE-POWER, SINGLE-CYLINDER REO RUNABOUT FITTED WITH A FOLDING REAR SEAT FOR CARRYING TWO EXTRA PASSENGERS.

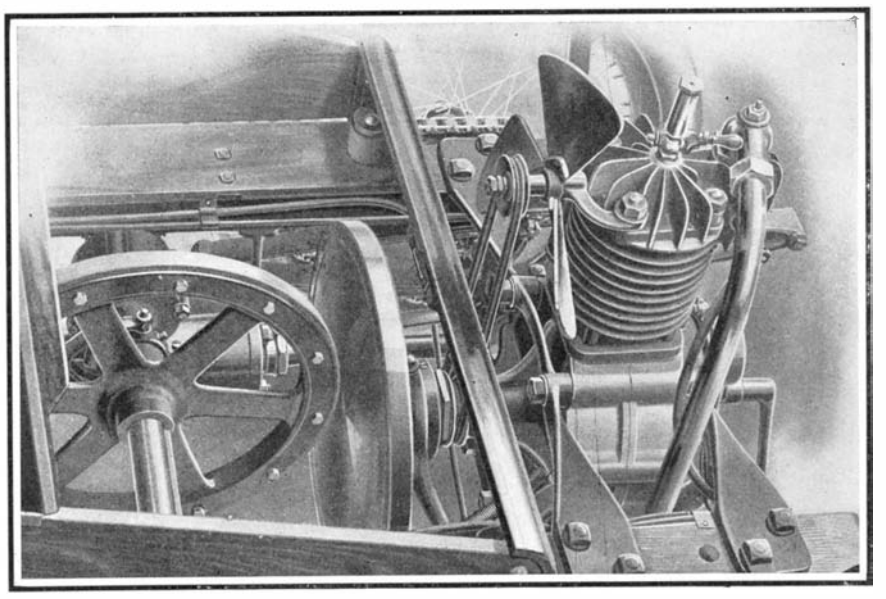


A 10-HORSE-POWER GENTLEMEN'S SPEEDSTER FITTED WITH DOUBLE-OPPOSED-CYLINDER ENGINE AND BEVEL-GEAR DRIVE.

A FOUR-CYLINDER AIR-COOLED RUNABOUT.

The latest application of the four-cylinder air-cooled motor to a light runabout is typified in the Waltham-Orient machine illustrated herewith. In this 1,300-pound car the motor is placed longitudinally under the bonnet with a fan in front to blow on it. A three-speed sliding-gear transmission is placed back of the motor and connected to the usual universally-jointed propeller shaft with a bevel-gear drive at the rear axle. The transmission is so arranged that no gears are in mesh when the car is running on the high speed. This arrangement is shown in the photograph reproduced herewith. For the intermediate and low speeds the sliding member, 4, 5, is moved to the left by shifting fork, *S*, until 5 meshes with 6 or 4 with 3. As rod *S'* (upon which *S* is mounted) is moved, it carries with it slide *G*. A roller on the end of lever, *E*, is set in a notch in this slide. The other end of *E* fits in a shifting collar, 9, of gear, 2, and *E* is mounted on a pivot at its center. As *S* and *G* move to the left, *E* moves a certain distance with them, or until the roller slips out of the notch and rides upon the edge of *G*. The other end of *E* is moved to the right and gear 2 is slid into mesh with gear 1 and held there until the high speed is again engaged. This speed is obtained by locking the left-hand end of the lower shaft to the short right-hand end carrying gear 1, by means of the jaw clutch, *M F*. The drive on the low and intermediate speeds is through 1-2-3-4 and 1-2-6-5 respectively, while the reverse is had through 1-2-7-8-4. Pinion 8 is the intermediate pinion in mesh with 7 and running on a stud attached to the gear case. This transmission has the advantage that all gears on the lay shaft are idle when the car is on the high speed.

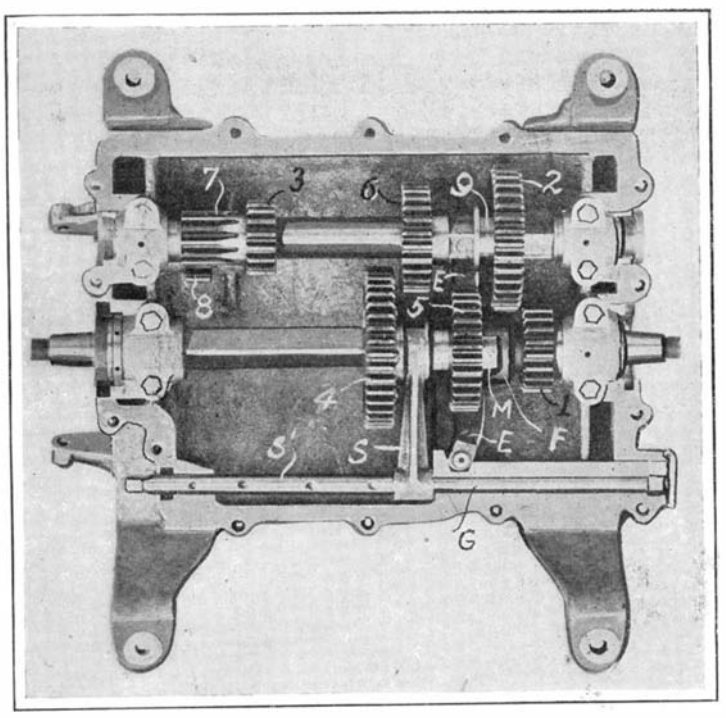
Another cut shows the carbureter with side broken away. The chamber on the left contains the float, which rises as the gasoline enters through the pipe in the bottom, and lowers the needle valve by means of the levers above it, until the gasoline reaches the desired level. The valve is then closed, and it opens slightly to let in the fuel in proportion as it is used. The gasoline is maintained in the spraying nozzle at the level shown. The air, aspired through the lower horizontal pipe, passes up through the hood around the spraying nozzle and out through the hole at the back, which is shown in the cut half closed by the throttle. The throttle lever is seen on top. The horizontal disk above the hood and spraying nozzle has a hole in the center and a ring of smaller holes just within its periphery. It is integral with the spider, *T*, and is held to its seat by the coiled spring shown. When the suction of the motor increases and more air is required, this valve is raised and an additional supply of air beyond what normally passes through the holes, is drawn in. The tension on the spring may be adjusted by the milled nut, *x*, on the top of the carbureter. The engine of this runabout has a 3¼-inch bore and 4¼-inch stroke. It is rated at 16 horse-power. A belt-driven fan running on ball bearings is used to keep it cool. A governor is fitted also. The crankshaft is supported in five long plain bearings. The 72-pound flywheel carries a leather-lined internal cone clutch which is accessible and may be readily removed. The engine is oiled by an automatic sight-feed oiler. Jump spark ignition with separate coils, and storage batteries is used. The commutator has a special wipe contact and is conveniently placed. The car has an 82-inch wheel base, standard tread, and 30 x 3½-inch tires. It will travel 40 miles an hour on a fuel consumption of one gallon per 15 miles.



THE FRICTION DISK DRIVE EMPLOYED ON THE BUCKBOARD RUNABOUT.

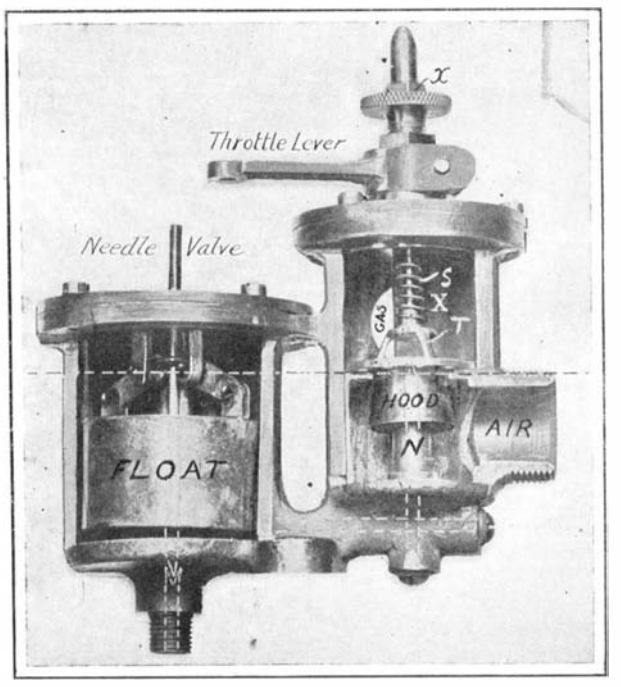
This form of drive has also been used successfully on heavy commercial vehicles and touring cars.

The other car shown is the very light, low-powered runabout, which has been developed from the buckboard originally built by this company. As with the buckboard, the motor is placed at the rear end of the car, being mounted on the frame of the body directly over the rear axle. The motor shaft is placed lengthwise of the car. On its forward end is a large friction disk. A countershaft placed in front of the disk carries a friction pulley at right angles to the latter. By sliding the pulley across the face of the disk any number of different speeds can be obtained. The reverse is obtained by sliding the pulley over to the opposite side of the disk, and any speed from the slowest to the highest can also be had in this direction. The friction disk arrangement is shown in the cut above. The countershaft drives the rear wheels by chains, as shown in the cut below. A fan is placed in front of the motor. The valves, commutators, and spark plug are readily got at from behind.



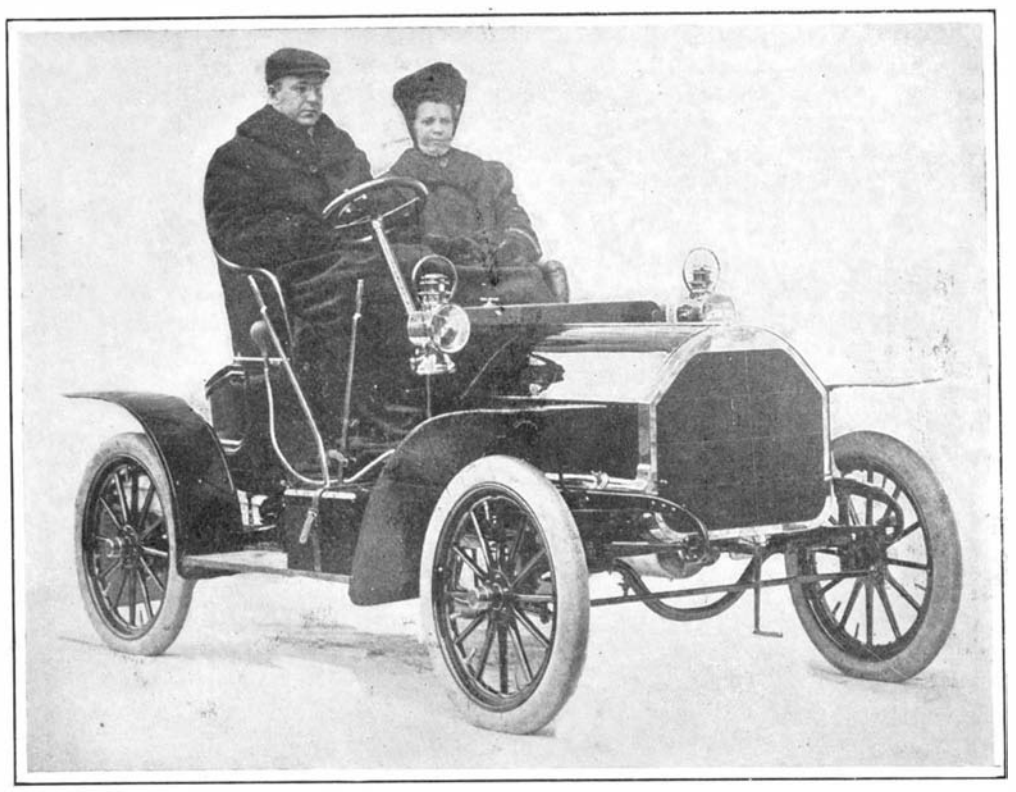
TYPICAL 3-SPEED SLIDING-GEAR TRANSMISSION SHOWING DIRECT DRIVE ON HIGH SPEED.

E. Lever for shifting gear 2. *F*, *M*, Jaw clutch for direct through drive. *S*, Shifting fork for sliding gears 4 and 5. *S'*, Rod with notches, to which *S* is attached. *G*. Notched slide adapted to move with rod *S*.

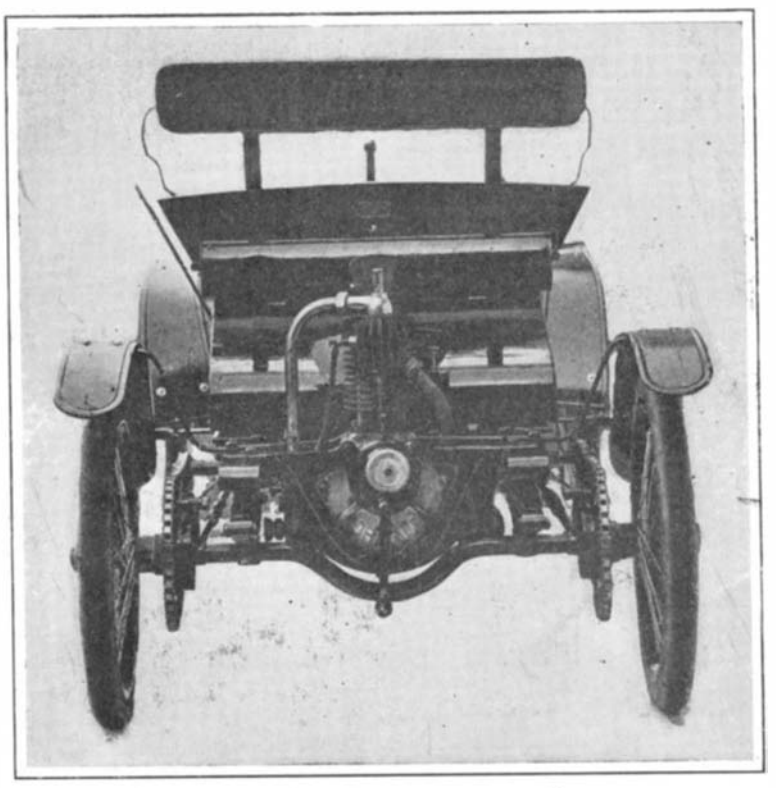


A TYPICAL FLOAT-FEED AUTOMATIC CARBURETER.

N, Spraying nozzle. *T*, Auxiliary air valve. *S*, Adjustable spring of air valve. *x*, Thumb screw for adjusting tension of *S*. *X*, Throttle valve.



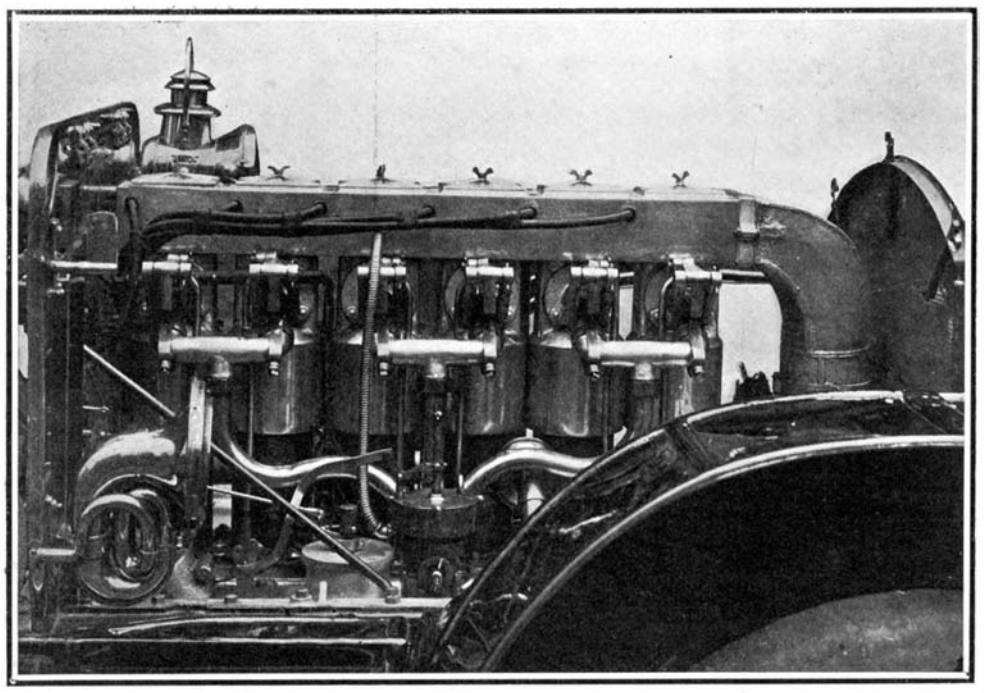
A 1,300-POUND RUNABOUT FITTED WITH A 16-HORSE-POWER, 4-CYLINDER, AIR-COOLED MOTOR.



REAR VIEW OF LIGHT BUCKBOARD, SHOWING DOUBLE CHAIN DRIVE FROM COUNTERSHAFT.

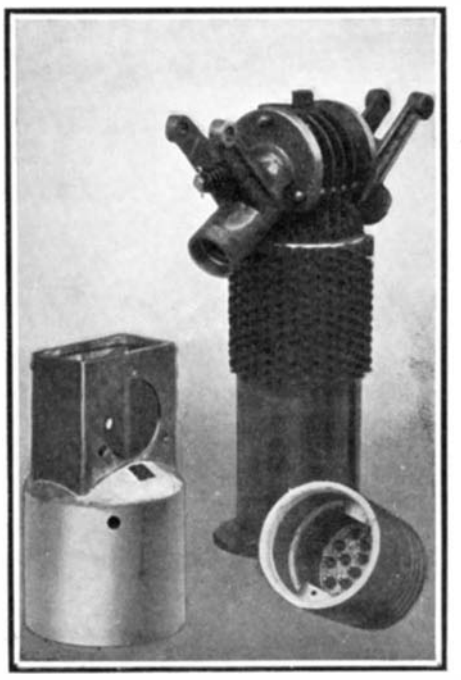
THE FRAYER-MILLER SIX-CYLINDER AIR-COOLED MOTOR.

One of the greatest improvements in automobile motors for this year is the development of the six-cylinder, four-cycle gasoline motor. The Napier Company, of England, was the first to bring out a racer with a six-cylinder motor, and to demonstrate the superiority of the same motor on touring cars. A number of foreign firms, as well as several of the leading American companies, are manufacturing six-cylinder water-cooled motors this year; but the annexed illustration shows a positively-cooled waterless six-cylinder engine of 4 1/16 bore by 5⅛-inch stroke, which is capable of developing 50 horse-power. The cylinders are cast with pin-like projections around the heads, as shown in the smaller cut. The valves are attached to each side of a cylinder head, and the whole cylinder is jacketed with an air jacket of aluminium. Air is blown by a powerful blower, gear-driven from the crankshaft in front of the motor four times as fast as the motor revolves. A pressure of about 2 ounces is produced in the large pipe running over all the cylinders, and this pressure is sufficient to force the cooling air down through the jackets and pins which project from the cylinder walls. So efficient is the cooling, that a relatively high compression—75 pounds—can be used without danger of premature explosions from heat. This system is one of the few in which the motor is positively cooled at all speeds. The car upon which this motor is mounted is fitted with a four-speed, selective-type transmission and bevel gear drive to the rear axle. Non-adjustable ball bearings are used liberally throughout the car, both in the transmission and the rear axle. The wheel base of the machine is 100 inches, and the tires 34 x 4. The difference in smoothness of running between a four-cylinder and a six-cylinder motor is found in the almost imperceptible impulses obtained from the latter, while those of the four-cylinder are distinctly noticeable. Furthermore, the six-cylinder engine is so flexible that the car can be driven at any speed from 4 to 60 miles an hour on the fourth speed gear under throttle control.



SIX-CYLINDER AIR-COOLED MOTOR OF THE FRAYER-MILLER CAR.

A gear-driven blower in front maintains an air blast in the pipe and down through the aluminium air jackets. The spark plugs are in the cylinder heads. Three pipes from the carbureter supply the three pairs of cylinders. Note also the vertical fender from mud guard to frame.

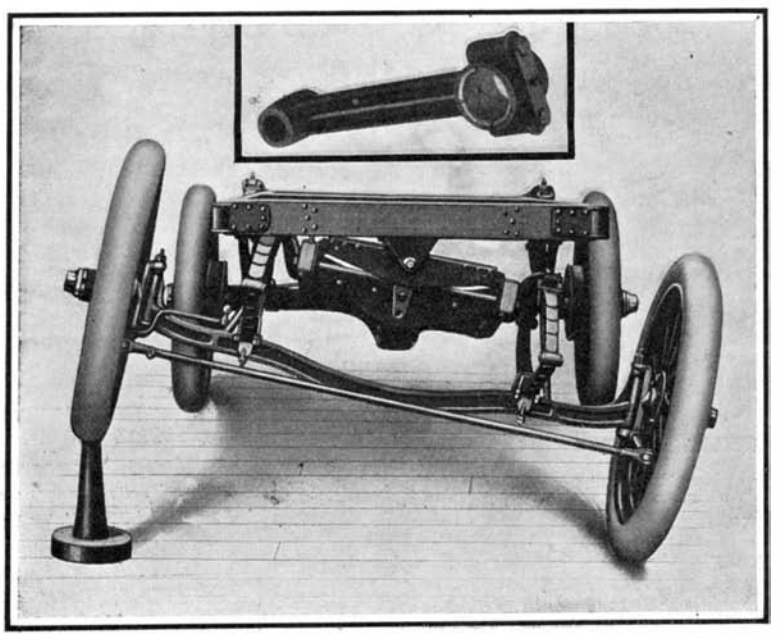


CYLINDER, AIR JACKET, AND PISTON OF FRAYER-MILLER MOTOR.

The cylinder has small heat-radiating pins cast on it, as has also the under surface of the piston head. The valves are bolted to cylinder head. The spark plug in top is got at through hand hole in bus pipe.

THE MARMON AIR-COOLED TOURING CAR.

The main features to be noted about this car are the carrying of the entire power mechanism on an independent triangular sub-frame, the elimination of chains and universal joints, and the mounting of both the body frame and sub-frame upon three pivoted points, which gives it extremely easy riding qualities. The photographs reproduced herewith show the general appearance of the car and motor, and the great flexibility of its running gear. In the end view of the chassis, in which one of the wheels is raised a foot from the ground, is this flexibility noticeable. The front end of the sub-frame is hung from the front springs, while its rear end, which forms the apex of an isosceles triangle, is revolubly mounted on a sleeve extending forward from the differential gear casing on the rear axle. The propeller shaft within this sleeve is supported in a ball bearing back of the driving pinion and in a roller bearing a short distance forward. The cross member of the sub-frame is pivoted at each end; and has rising from its center a pivotal support for the main frame. This pivot allows the latter frame to tilt and assume any inclination given it by the rear springs, which support its other end. A vertical movement of either front wheel does not affect the main frame in the least (as shown in the cut), and it merely causes the sub-frame to rock around its point of support at the rear without any strain to the mechanism this frame carries. A vertical movement of either rear wheel, on the other hand, tips the main frame correspondingly but affects the sub-frame not at all, save to raise its rear end the same distance the rear axle rises in the center. Thus it can be seen that neither frame is submitted to any twisting strains whatever, and that the carriage body is not affected by obstructions passed over by the front wheels. Both frames are of armored wood. The sub-frame consists of an oak I-beam inclosed in steel.

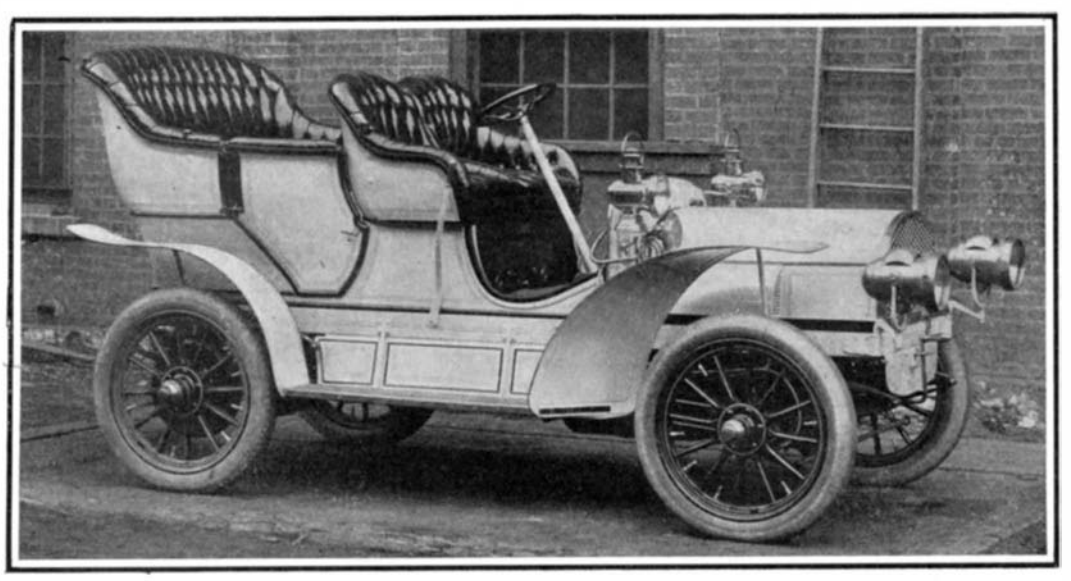


FRONT END OF MARMON CHASSIS WITH WHEEL RAISED ONE FOOT.

As a result of the double three-point suspension, the sub-frame is tipped but the main frame remains horizontal. Small cut shows pipe for carrying forced circulation of oil to wrist pin of motor.

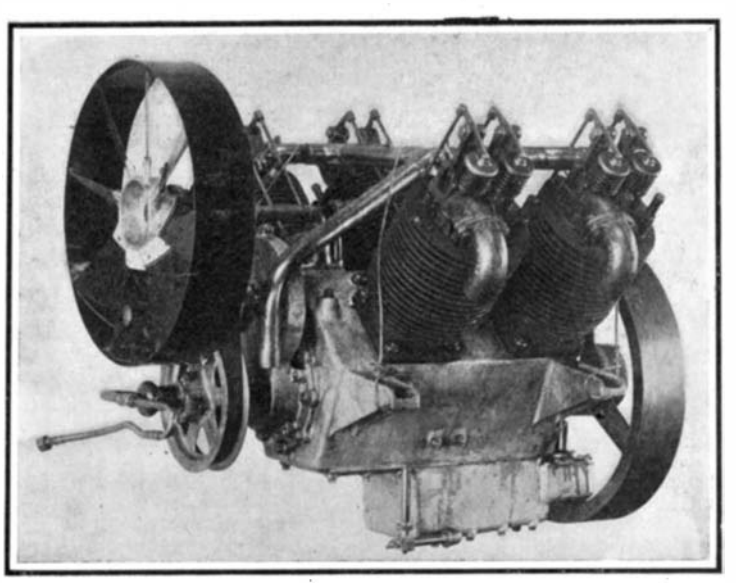
The motor is a 4⅝ x 5½-inch four-cylinder engine with cylinders in pairs set at an angle of 90 deg. It develops 28 horse-power at about 1,200 R. P. M. The valves are in the cylinder heads, operated mechanically, and fitted with large spiral springs. A belt-driven fan sends a powerful draft of air between the cylinders, and a plow within the bonnet diverts it to the heads. The draft produced by the motion of the car strikes the heads directly by passing through openings in the sides of the bonnet. An oil pump in the base of the crankcase forces oil from an oil well through a suitable pipe and stuffing box into the front end of the crankshaft. This is hollow and has small holes opening into all the bearings. The crank pin boxes have corresponding holes connected by straight oil pipes to the wrist pins, so that the oil is forced to all parts of the engine, and a spray of oil, exuding from the bearings, lubricates the pistons. A gage on the dash indicates the oil pressure. The two-speed planetary transmission is carried on the propeller shaft, which is without support between the engine and the foremost of the two bearings that carry its rear end. The transmission is without internal gears. Its three sets of three pinions are each formed from one piece. The clutch and bronze brake bands are large and run in oil. The reverse can be used as a brake if

(*Continued on page* 49.)



THE MARMON AIR-COOLED TOURING CAR WITH ALUMINIUM BODY AND DASH.

Note the fenders between running board and body in addition to those over the wheels.



THE 4⅝ X 5½ MARMON AIR-COOLED MOTOR, SHOWING PIPE CONNECTED TO HOLLOW CRANKSHAFT FOR CIRCULATION OF OIL FROM TANK IN BASE.

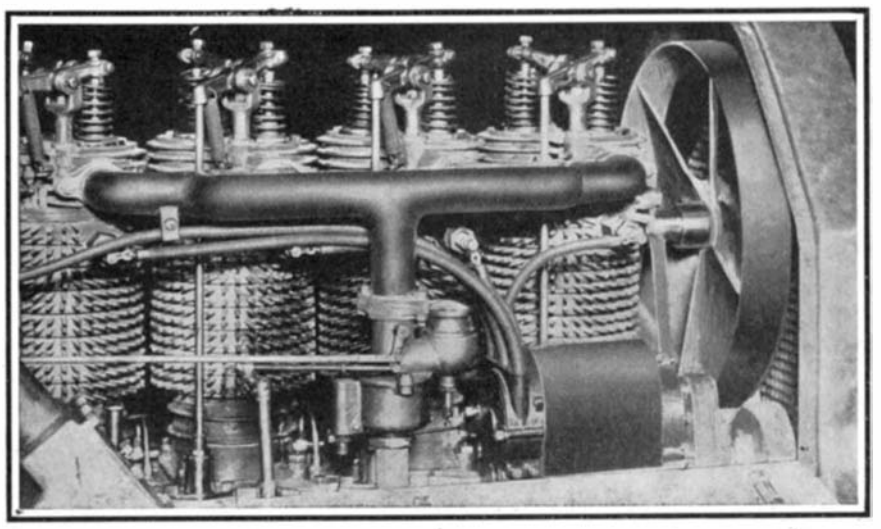
A REVOLVING-CYLINDER MOTOR CAR.

A machine of distinctive design, and having a motor of decidedly original construction is illustrated herewith. This machine showed its capabilities in the Chicago-St. Paul tour last July, when it covered the 500-odd miles through mud and rain in good time, it making the best time of the two air-cooled cars which completed the run.

The motor of this car is similar to the Balzer engine described in our 1904 Automobile Number, the main difference being that the former has its cylinders revolving in a horizontal instead of a vertical plane. The A. F. motor is controlled by variable compression, the charge from one cylinder being almost entirely expelled and sucked into another when the engine is running light. The carbureter is replaced by a gasoline pump which sprays the fuel through a pipe, *P*, into chamber, *C*, containing a leather gas-supply bag from which the gas is drawn to the cylinders through passages, *D*. The mixture is obtained by regulating the stroke of the pump. The spark is advanced automatically according to the speed of the motor. A positive-feed oil pump lubricates all parts of the motor with certainty. A single spark coil with vibrator answers for all the cylinders. The spark jumps outside the motor from the stationary conductor, *B*, to the porcelain binding post, *F*, on the revolving crankcase, whence the secondary current passes through a wire to the plug, *G*. The inlet and exhaust valves are in the cylinder heads, each pair being operated by a single lever pivoted between them and rocked by suitable cams in the crankcase. Auxiliary exhaust ports, *E*, with wire gauze, make a muffler unnecessary. The entire power plant, transmission included, weighs 480 pounds, 230 pounds of which represents the weight of the motor. The revolving part of the motor—cylinders and crankcase—weighs 190 pounds; so that, although there is no flywheel, the effect of a 190-pound flywheel is obtained. The motor weighs only 9 pounds to the horse-power. At a speed of 600 R. P. M. the air rushes over the longitudinal flanges of its cylinders at the rate of a mile a minute. This positive cooling of the cylinders at all speeds and without the use of fans or blowers, is the one chief feature of this car. Because of it, the car can be run at all times and under all conditions without loss of power from overheating. A 5 x 5 five-cylinder motor giving 45 horse-power is the largest engine that has been built thus far, but engines of still greater horse-power could no doubt be made to run successfully.

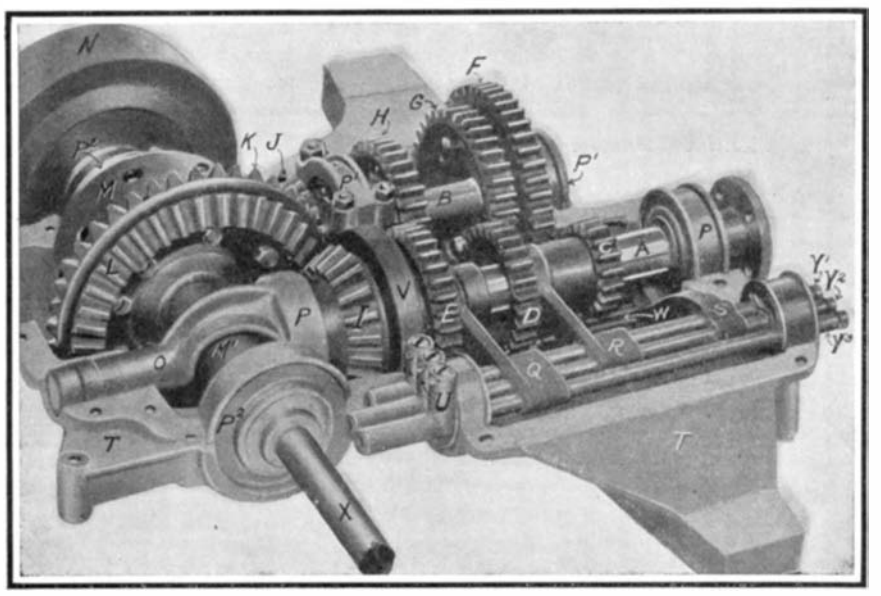
The transmission is of the planetary type giving two speeds ahead and a reverse, but a simple arrangement of sliding gears used in connection with it makes possible the obtaining of two more speeds ahead and another reverse. The countershaft carrying the transmission is directly below the motor and is driven through bevel gears. A single chain from it to the differential on the live rear axle transmits the power.

Because of the light weight of the power plant, the car with its heavy closed body weighs only 2,000 pounds. The steering control levers can be quickly changed to the inside if necessary, and the front seat and footboard be closed. The car is thus an ideal two-passenger car for stormy weather or a five-passenger open car (by letting down the windows) for fair weather.



THE 4¾ x 5½ KNOX 4-CYLINDER AIR-COOLED MOTOR.

Note the auxiliary coil springs on rocker arms of inlet valves; also wires running direct to spark plugs from high tension distributor on gear-driven magneto. The carbureter and fan are also plainly visible.



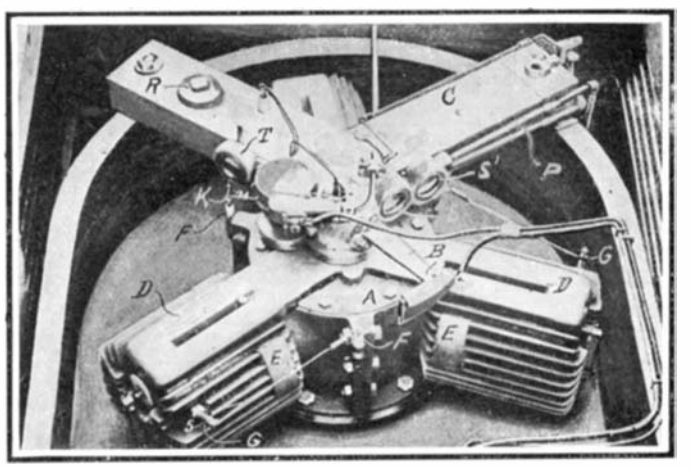
THE NEW MERCEDES-TYPE SELECTIVE TRANSMISSION HAVING A DOUBLE BEVEL GEAR DRIVE.

A NEW FOUR-CYLINDER AIR-COOLED MOTOR AND SELECTIVE-TYPE TRANSMISSION.

A new form of selective-type transmission giving four speeds ahead and a reverse, with direct drive on the high speed, is shown in the annexed cut. The main shaft, *A*, is very large in diameter, and has four integral fluted keys to drive the sliding gear members. It is coupled directly to the clutch shaft of engine and runs in bearings, *P P*, the rear bearing being bolted to the bottom of the case and also braced by arm, *O*, which is arched over the cross shaft to the rear end of case. The second motion shaft, *B*, runs in bearings, *P' P'*, and has gears, *F G H*, rigidly secured on it. The differential gears are of the bevel style and are inclosed in the perforated case, *M*, which has its ends extended from sleeve, *M'*, and runs in bearings, P^2 P^2. Brake drum, *N*, is firmly secured to case, *M*, and has two metal shoes which are applied by a pedal. Two bevel gears are secured to the periphery of *M*. One, *L*, is the direct high-gear drive, meshing with pinion, *I*, and the other is the drive for lower speeds, meshing with pinion, *J*, on the second motion shaft. Bevel pinion, *I*, is integral with internal gear, *V*, and runs on ball bearings on shaft, *A*, except when it is clutched to this shaft by sliding the gear, *E*, into mesh with *V*, by means of fork, *Q*, and shifter bar, Y_3, giving fourth speed on direct drive. On this drive bevel gears, *J* and *K*, and shaft, *B*, are running idle, and gears, *F G H*, are not in mesh. Meshing *E* with *H* gives third speed. By means of fork, *R*, and shifter bar, Y_2, *D* is meshed with *G* for second speed or *C* with *F* for first speed, *C* and *D* being integral. Reverse gear, *W*, is mounted between two supports on the bottom of case and shifted by fork, *S*, and shifter bar, *Y'*, into mesh with *C* and *F* for the reverse motion. Spring-pressed balls in the cases, *U*,

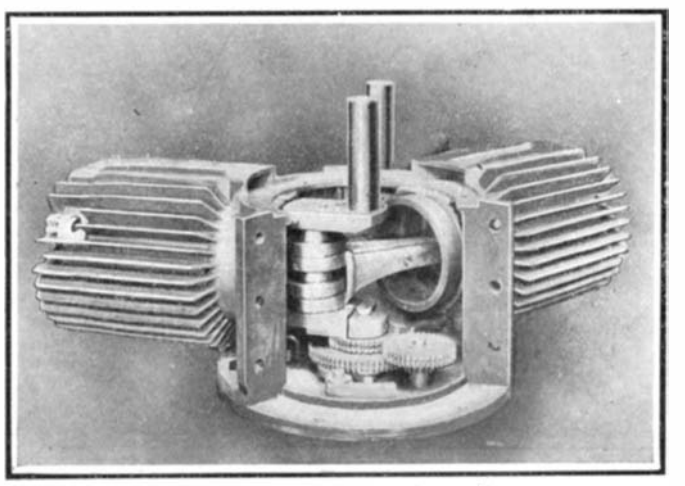
(*Continued on page* 49.)

AN EX-SPEAKER AND A WELL-KNOWN SENATOR READY TO RIDE IN AN ADAMS-FARWELL REVOLVING-CYLINDER MOTOR CAR.



THE MOTOR AS SEEN WHEN BACK COVER IS RAISED.

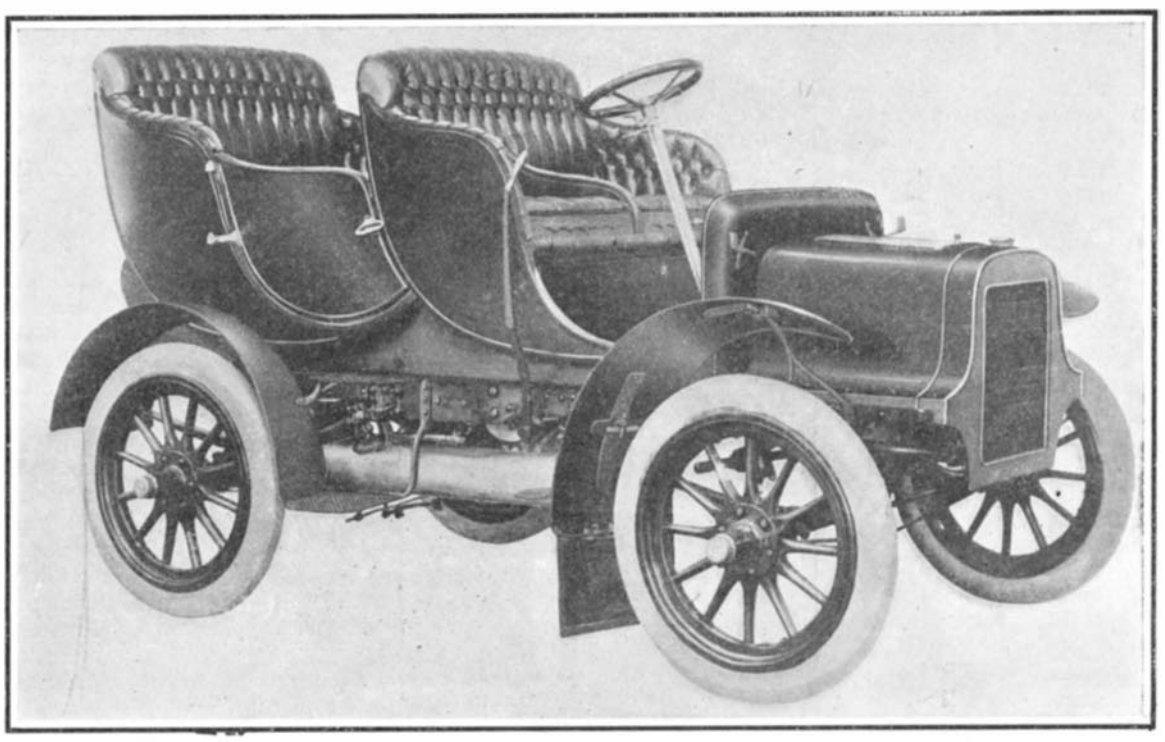
The motor is located underrear seat and can be readily inspected from behind the car. Parts: *A*, revolving crankcase; *B*, arm carrying insulated sector to which jump-spark wire is attached; *C*, gasoline tank and carbureter; *D*, inlet and exhaust passages to valves in head; *E*, auxiliary exhaust ports; *F*, porcelain binding post connected to spark-plug *G*; *K*, commutator; *P*, gasoline pipe from pump; *R*, oil tank; *SS'*, bulls' eyes showing gasoline level; *T*, ditto for oil.



MOTOR WITH ONE CYLINDER REMOVED, SHOWING ARRANGEMENT OF THREE CONNECTING-RODS ON ONE CRANK.

THE CADILLAC SINGLE-CYLINDER LIGHT TOURING CAR.

The graceful lines of the new single-cylinder Cadillac are apparent from our illustration. As far as the mechanism is concerned, this has undergone no radical change since the first car was built over three years ago. The workmanship is so good that many of the early cars are still in use to-day after receiving many hard knocks, yet being in constant service for several seasons. Simplicity and service are the things for which this car is noted chiefly. It is so constructed that any of the parts (including the crankshaft bearings) may be readily and cheaply renewed. Its single cylinder is fitted with a copper water jacket which is clamped in place without the use of gaskets. A thorough water circulation is maintained by a positively-driven centrifugal pump. The carbureter consists of a simple mixing valve operated by the suction of the motor. The spark plug is made up of two mica plugs set in a suitable cap. As both terminals of the plug are insulated, it does not short-circuit readily. The 1906 car is fitted with a mechanical oiler driven by a cam on the countershaft. This oiler forces oil through large pipes to the bearings, cylinder, and crank, the result being that the wearing parts are always properly lubricated. A very good feature of the car is that the starting crank can only be put on when the spark is retarded—an arrangement which makes a "kick back" of the engine impossible. The bore and stroke of the motor is 5 inches. Eight horse-power is guaranteed at the start, but after an engine has been run several months, a brake test will often show 10 horse-power or over at 1,300 R. P. M. The runabout will go 20 to 30 miles on a gallon of fuel, and the touring car 17 to 20. On English roads as high as 40 miles on a gallon has been attained. The front end of the machine is supported by a transverse spring mounted on a rocker which sets upon the upwardly-curving tubular front axle. Thus the axle can be raised at either end without affecting the body in the least. The car is fitted with double band brakes on the differential, which is driven from the engine by a hardened detachable roller chain of the cotter-pin type.



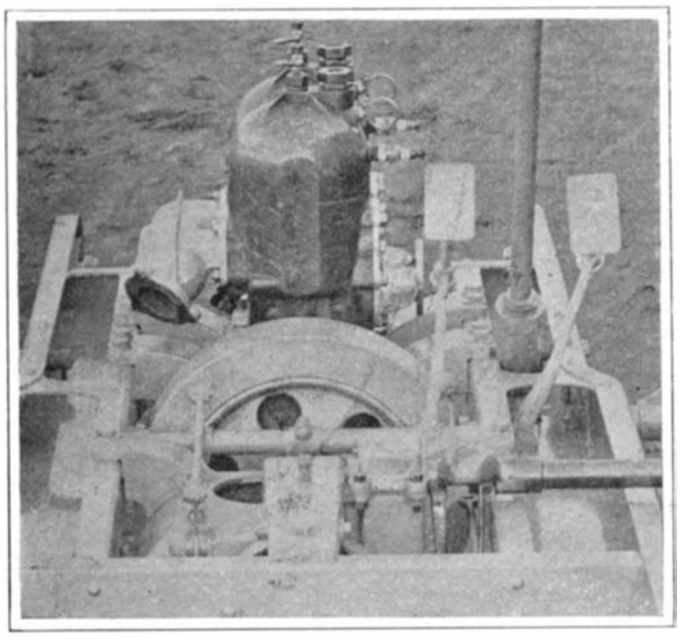
THE NEW CADILLAC 8-HORSE-POWER SINGLE-CYLINDER TOURING CAR.

The Cadillac company are also making two four-cylinder cars having 4⅜ x 5 and 5 x 5 engines respectively and being fitted with their three-speed planetary gear. These cars are very similar to that illustrated in our issue of December 16 last.

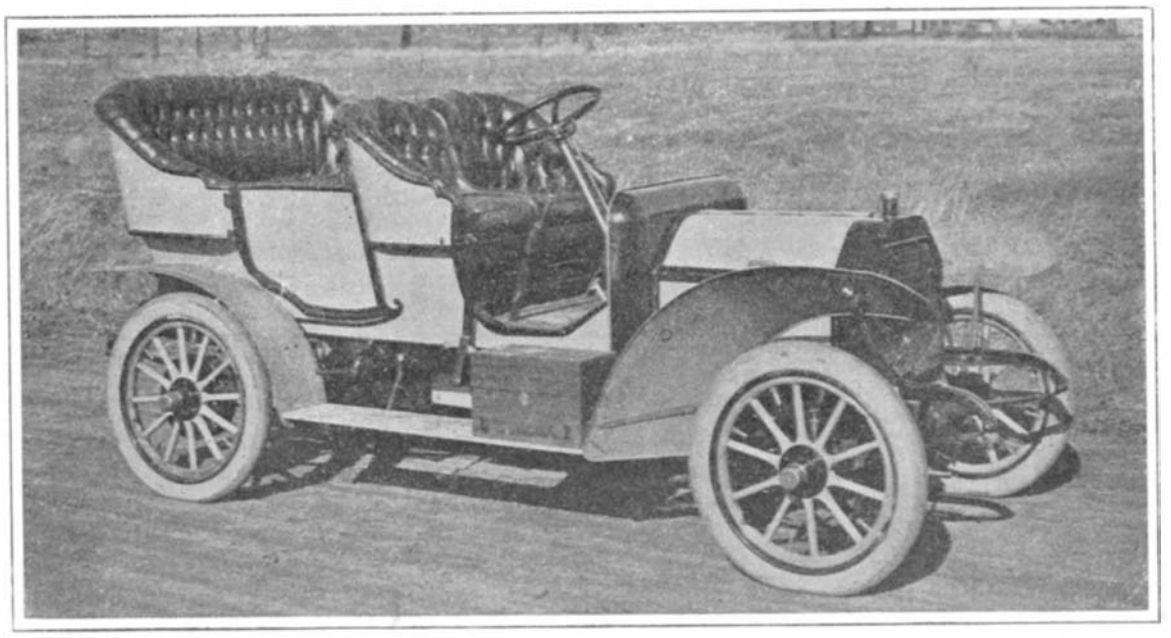
THE OLDSMOBILE TWO-CYCLE AND FOUR-CYCLE TOURING CARS.

The Olds Motor Works have this year brought out a new, light, side-entrance tonneau, shown herewith, which has for its motive power a two-cylinder, vertical, two-cycle engine, placed in front under the bonnet. The chassis of this car is identical with that of the larger four-cylinder four-cycle touring car. The front end of the two-cycle chassis is shown herewith. The motor is substantially constructed, having a large crankshaft and bearings 3 inches long. The latter have adjustable boxes for taking up the wear. A relatively high compression (about 8 pounds) is obtained in the crankcase, the space of which is filled by aluminium disks on the crankshaft. The transfer ports are of liberal dimensions, and as direct as it is possible to make them. The result is that about 25 horse-power is obtained with two 5 x 5-inch cylinders. This power is transmitted to the rear wheels through a three-speed sliding-gear transmission of the selective type and the usual universally-jointed propeller shaft and bevel gear drive at the rear axle. The latter is fitted with roller bearings, while the transmission has babbitt bearings, lubricated by oil-soaked waste. The transmission gears are of high-carbon steel, tempered and hardened. The lower half of the transmission case is removable, and the upper half is provided with an inspection cover for examining the gears. The view of the chassis from beneath shows very distinctly the arrangement of the different parts. A universal joint

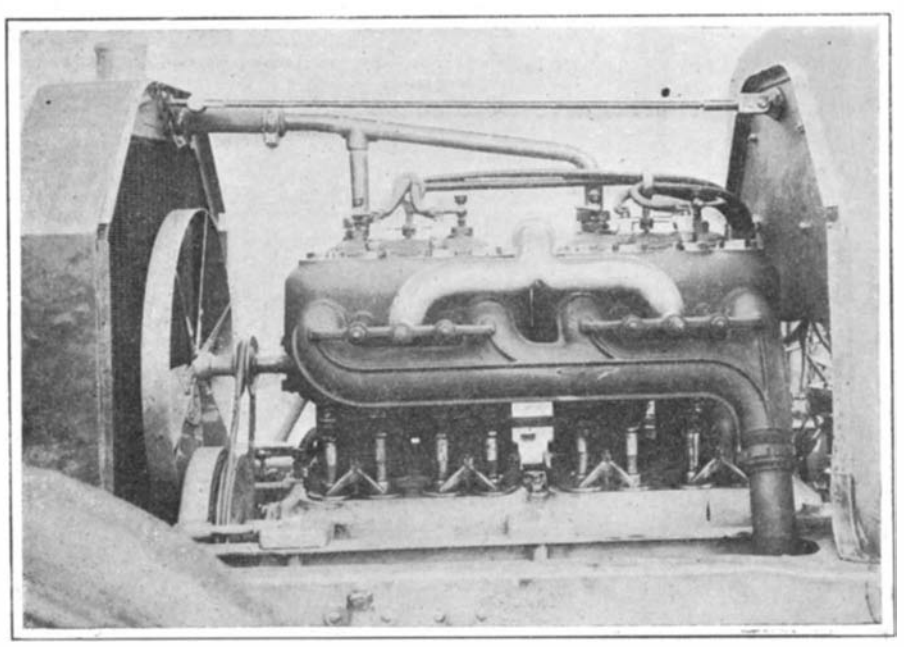
(*Continued on page* 50.)



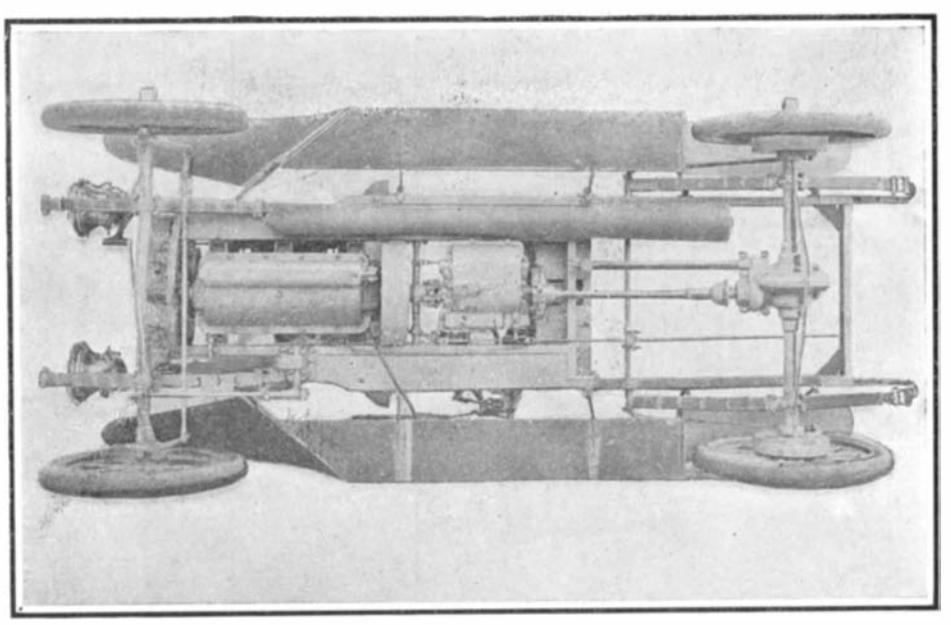
FRONT END OF CHASSIS OF OLDS 2-CYCLE CAR, WHICH HAS TWO 5 x 5-INCH CYLINDERS.



THE OLDS LIGHT, 2-CYLINDER, 2-CYCLE TOURING CAR. WEIGHT, 1700 POUNDS.



THE 4¼ x 4¾, 4-CYLINDER, 4-CYCLE OLDS TOURING-CAR MOTOR.



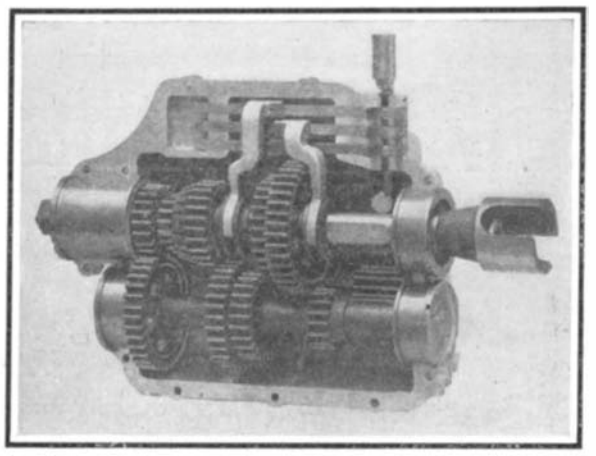
UNDER SIDE OF CHASSIS OF OLDS 4-CYLINDER CAR. A TYPICAL CHASSIS WITH BEVEL GEAR DRIVE.

A DETACHABLE LIMOUSINE TOURING CAR.

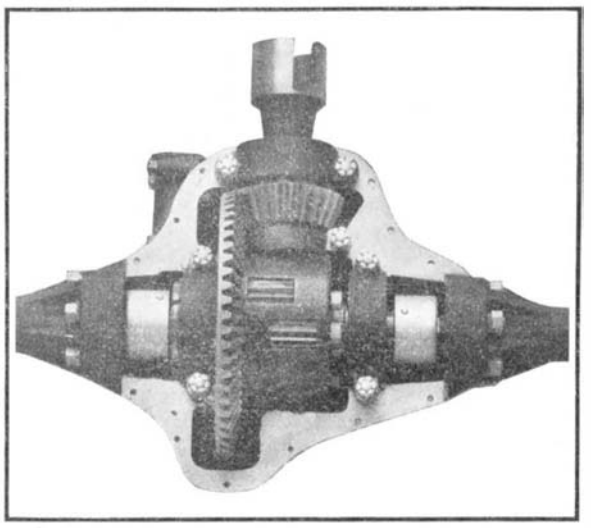
A strong, well-built touring car having a detachable Limousine top and several other novel features, is that made by the Welch Motor Car Company, of Pontiac, Mich. This machine has a standard 4⅝ x 5-inch four-cylinder motor, having a range of from 150 to 1,800 R. P. M., and rated at 30 to 36 horse-power. The top view of the motor, shown herewith, gives a good idea of the arrangement of the valves in the cylinder heads. The latter are made as near spherical as possible, so that the wall surface exposed to the flame is about one-third less than in the usual motor. This arrangement allows of the charge entering the cylinder quickly and in a cool condition. A full charge is drawn in and expelled from every cylinder during each two revolutions of the crankshaft. This form of cylinder and arrangement of valves is similar to that of the Fiat engine, which, it will be remembered, made such a remarkable performance in the Vanderbilt cup race last October. The burning of the charge is said to be quicker and more complete in a spherical combustion chamber, as the flame does not have to travel more than one-fourth as far as it otherwise would, in order to complete the ignition of the charge. Furthermore, the loss of power through the absorption of heat by the cooled cylinder walls is also largely cut down. On account of these facts, the makers claim 20 per cent more power than is obtainable with motors of the same size and of the usual construction. The perfect combustion of the charge and the straight exit it makes through the valve in the head eliminate all exhaust valve troubles, and make the motor particularly reliable.

The transmission used on this car has its gears always in mesh; but, by means of individual, multiple-disk clutches, no gears are running on the high speed. There are but two speeds forward and a reverse. Two multiple-disk clutches, of 150 square inches friction surface each, and a sliding jaw-clutch, are used to obtain these three speeds. All speeds are obtained with a single lever at the right of the driver, and the car can be thrown instantly from the high speed into the reverse.

A novel feature of this car is the arrangement of the pump (which is of the centrifugal type) in the center of the honeycomb radiator. The spindle of the pump projects through at the back of the radiator, and has the fan mounted upon it. A pulley on the hub of the fan is driven by a belt from a corresponding pulley on the crankshaft. The valves of the motor, which are set at an angle of 45 degrees, are operated by a central camshaft running over the cylinders and driven by bevel gears from the crankshaft. The timer is also located on a vertical bevel-gear-driven shaft, at the forward end of the motor. High compression is used in this engine, and is said to make it very efficient.



The Peerless 4-Speed, Selective-Type Transmission.



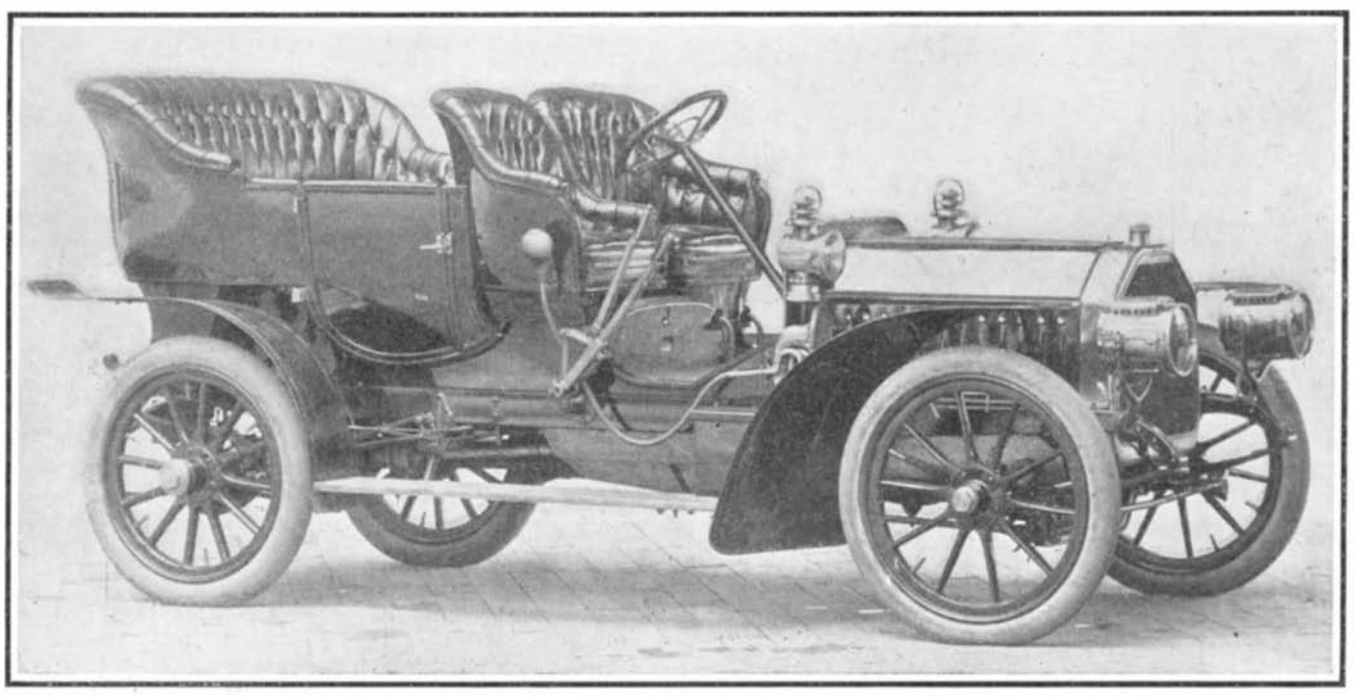
The Peerless Bevel Gear Drive, Showing Spur Gear Differential with Ball Bearings and Universal Joints on Each Side.

The radiator contains 13,500 square inches of radiating surface. It is made up of seamless brass tubing, and, although all the tubes form a solid mass, any one tube can be easily removed and replaced, if necessary. If the pump should cease to work, the radiator would still operate on the thermo-siphon principle. This car is noted for the use of plain bearings almost throughout. These are very generous in size, and are made invariably of steel on bronze, each bearing being automatically flooded with oil. A telescopic steering post is one of the novel features of this machine, and is an arrangement which adds greatly to the comfort of the driver in getting in and out of the car. The Welch machine is one of the largest and most handsomely finished American touring cars. Besides the novel features in its construction, the fact that the closed Limousine top may be removed wholly or in part makes it a particularly useful car for all-year service.

THE PEERLESS 30-HORSE-POWER TOURING CAR.

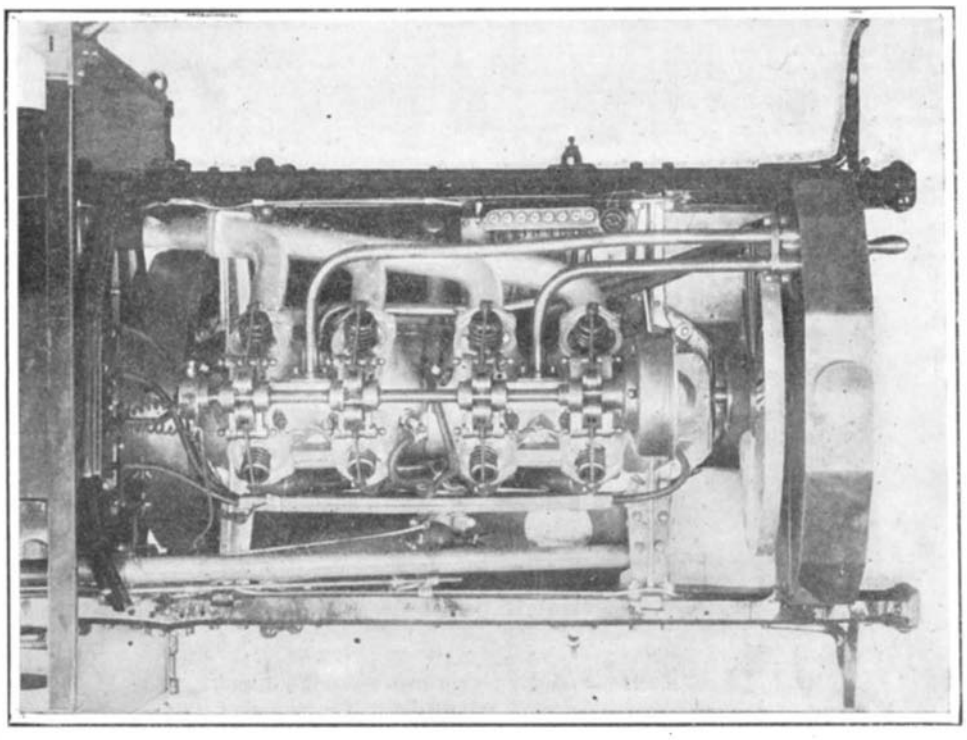
The new touring car put out by the Peerless Company, while having no very radical changes over last year's machine, has been improved in various places and brought thoroughly up to date. The cylinders of the motor are cast in pairs, with inlet and exhaust valves on either side and mechanically operated by separate camshafts. All the valves and valve springs are interchangeable. The cylinder castings are imported from France, and great care is taken in the boring and finishing of the cylinders. The bore and stroke of these cylinders are 4½ by 5 inches, and the motor develops its full power at 1,000 R. P. M. All gears, as well as the water pump and governor, are completely incased. The motor is lubricated by the splash system, the oil being fed by a mechanical lubricator. An automatic float-feet carbureter having a water jacket supplies the gas to the engine. Ignition is by storage batteries and individual coils. The commutator is located just back of the rear cylinder, it being set at an angle of 60 degrees and driven by bevel gears from the camshaft. The commutator consists of a roller

(*Continued on page 50.*)



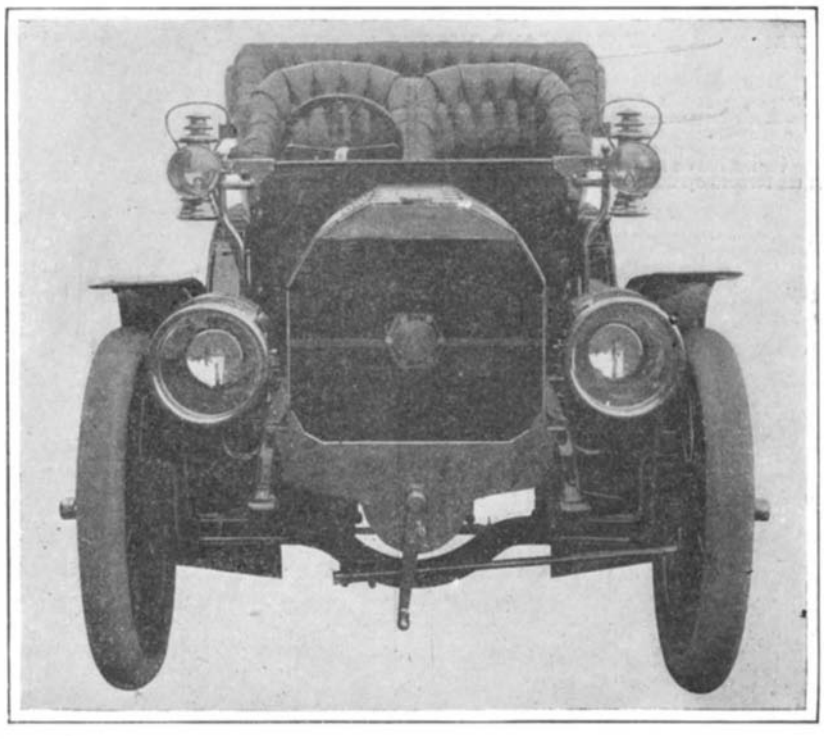
THE 1906 PEERLESS 30-35-HORSE-POWER TOURING CAR HAVING SHAFT DRIVE AND 4-SPEED TRANSMISSION.

Note the complete protection of engine and transmission by means of a steel pan.



TOP VIEW OF THE WELCH 4⅝ x 5, 4-CYLINDER MOTOR.

The valves set at an angle of 45 deg. in the cylinder heads and operated mechanically by rocker arms moved by a central longitudinal cam shaft, are the main features of this engine. The commutator is on the left-hand end of camshaft, the other end of which is driven by an incased bevel gear. The spark plugs are seen in the cylinder heads, the 8-feed mechanical oiler beside the upper frame, and the individual exhaust pipes and twin water pipes, as well as the belt-driven fan, are also distinctly visible. The long rod at the bottom of cut is the patent telescopic steering column.



THE 30-36-HORSE-POWER WELCH 4-CYLINDER TOURING CAR TO WHICH A LUXURIOUS LIMOUSINE TOP CAN BE ATTACHED.

Note the heavy I-beam front axle and the centrifugal water-circulating pump in the center of the radiator. The latter is a novel and distinctive feature of the Welch car.

HIGH-POWERED AMERICAN TOURING CARS.

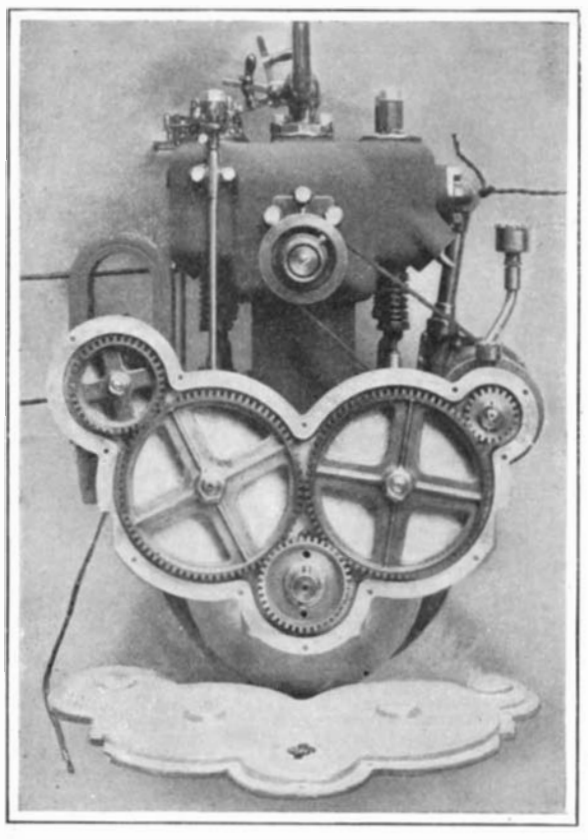
CLEVELAND 30-HORSE-POWER TOURING CAR.

A substantially-built touring car of modern construction is the 30 to 35-horse-power Cleveland shown in the annexed illustrations. This car is thoroughly up to date and, besides the usual three-speed transmission and bevel-gear drive, it has several improvements that are usually found on the best foreign cars. The first of these is the adoption of the low-tension make-and-break system of ignition with a gear-driven Sims-Bosch magneto as the source of current. The operation of the igniters is shown in the smaller cut. By referring to this cut, the reader can see that the chief parts of each igniter mechanism consist of a small cam-shaped projection, *T* (which is part of the movable stem of the igniter) and a long finger, *D*, which is mounted upon an eccentric and is clamped to a vertical rod driven by bevel gears from the camshaft. Another eccentric, *E*, is placed beside the finger, *D*, and the latter is held against *E* by a light spring, *F*. Another light spring, *S*, separates the electrodes after they are pressed together by the finger, *D*, and then suddenly released. A reciprocating motion is given *D* by the eccentric upon which it is mounted, and as it approaches the finger, *T*, it is pushed sideways by the eccentric, *E*, so that after it has moved *T* a certain distance and made the contact within the cylinder, it slips off *T* and allows the latter to spring back, under the influence of the spring, *S*. The result is the circuit is made and quickly broken, which gives a large spark. The insulated post of the igniter is shown just at the left of *F*. This is connected to a common bus-bar by means of switches, seen above the motor in the other view. The system of levers, *H*, *H*, *H'*, are connected so as to rock the different eccentrics, *E*, and cause them to throw the rods, *B*, out of contact with the fingers, *T*, earlier or later. The spark is retarded in this way when starting, and afterward it is set about at dead center. As the magneto speeds up, the spark increases in volume and ignites the gas quicker, which has the same effect as an automatic advance.

THE 30-35-HORSE-POWER CLEVELAND 4-CYLINDER TOURING CAR.

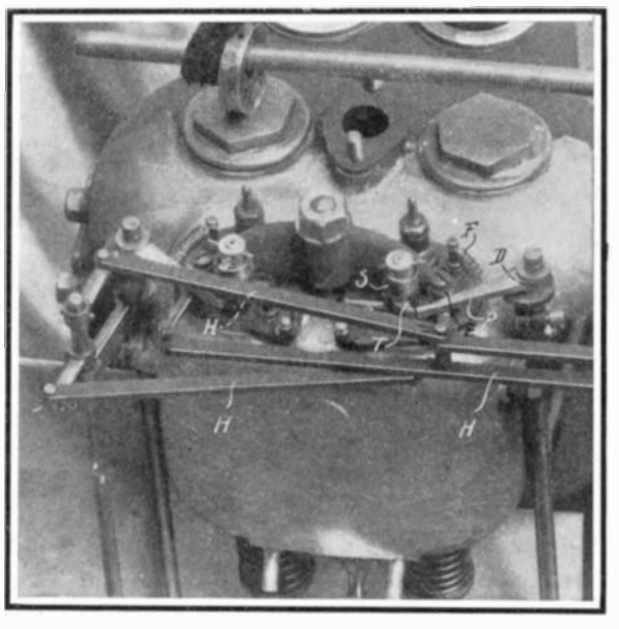
The end view of the motor shows the two half-speed gears in mesh with the smaller gear on the crankshaft. These drive still smaller gears, which rotate the water pump and fan (through a belt) and the magneto, respectively. The illustration shown above on the left is a typical end view of a modern motor having valves placed symmetrically on each side. The present practice is to inclose all the gears and run them in an oil bath, which gives them a long life and does not produce much noise. The motor is built strongly and of the best material. It is lubricated by a force-feed oiler, which supplies oil to all of the bearings. The crank-pin bearings are fitted with patent ring oilers, with which the oil is thrown by centrifugal force into the hollow crank-pin. The cylinders are 4⅛-inch bore by 5¼-inch stroke. The transmission gives three speeds forward and a reverse, with a direct drive on the high speed. It is connected with the rear axle through the usual propeller shaft having two universal joints, the rearmost of which is provided with a slip joint, to compensate for the vertical movement of the car upon its springs. The rear axle is of the usual tubular type, with which the wheels are carried upon ball bearings. The differential gear within this axle, and the live axles which drive the wheels, all run on ball bearings. Internal expanding brakes are placed in the rear wheels. The muffler of this car is much like that of the Richard-Brazier. It is composed of concentric tubes having perforations of sufficient area to allow the gas to expand from one chamber to the other without back pressure. Flattened tubes projecting back of each rear wheel emit the exhaust gases, which lay the dust rather effectually. The machine is fitted with 34 x 4-inch tires,

(*Continued on page 51.*)

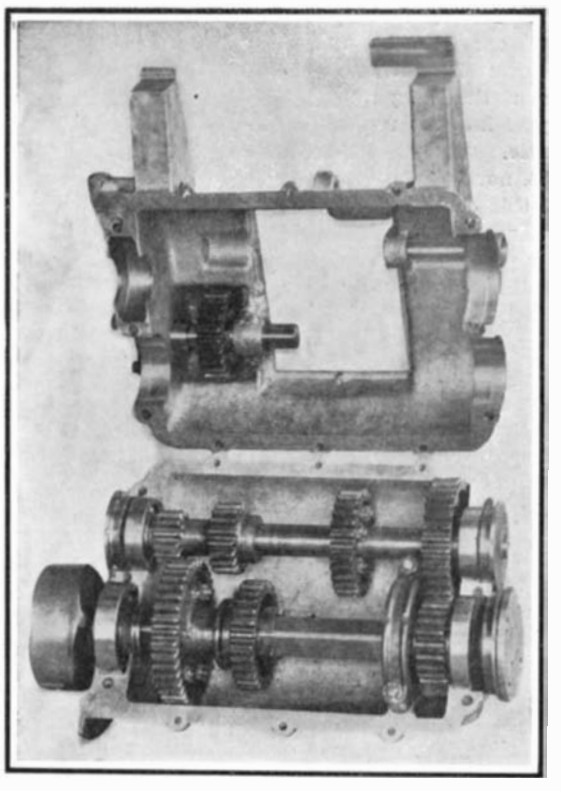


FRONT VIEW OF CLEVELAND MOTOR WITH GEARS EXPOSED.

Note make and break igniters with knife switches above on left and gear-driven magneto below; also centrifugal water pump and pulley for fan on gear-driven shaft on right. The large gears are on the cam shafts for operating the valves. These shafts run at half the speed of the motor. The vertical rod on left-hand side of motor operates the igniter mechanism of the forward cylinder and is revolved by a bevel gear on the camshaft.

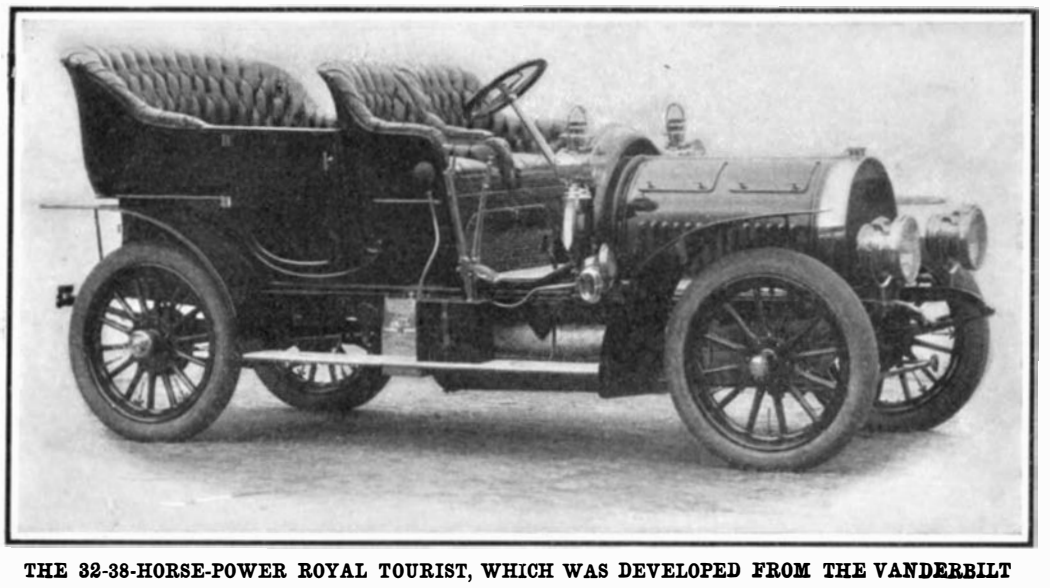


IGNITER MECHANISM OF ONE PAIR OF CYLINDERS OF CLEVELAND TOURING CAR.

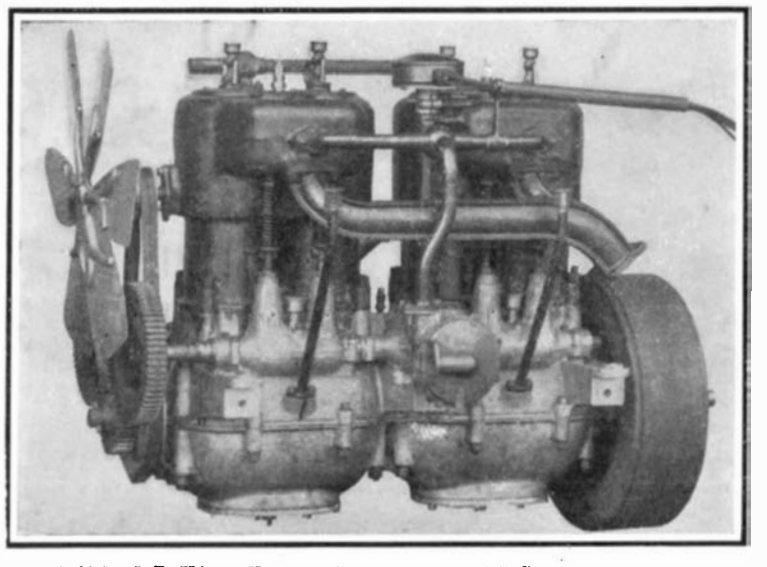


GEAR BOX OF THE ROYAL TOURING CAR

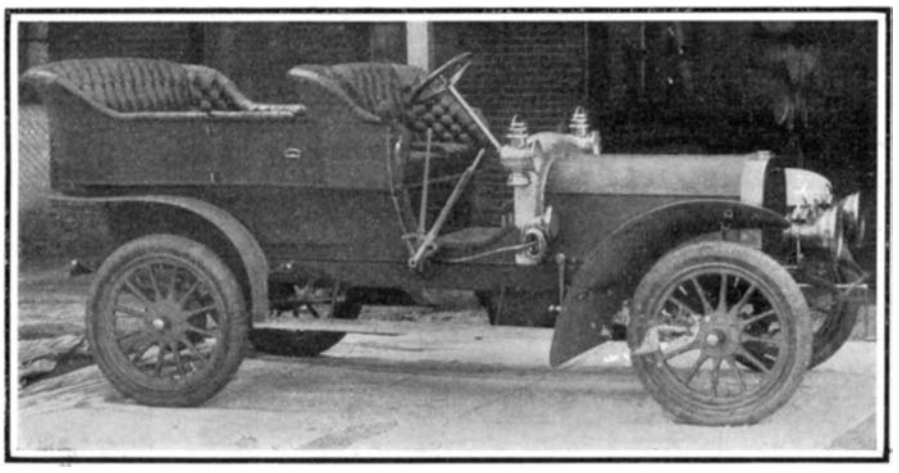
This is a typical 3-speed sliding-gear transmission. The hangers are on the top of gear box, which also carries intermediate pinion for the reverse. The single sliding member on square lower shaft is moved by a fork fitting in collar between the two gears and mounted on a slidable rod carried in top of case. The jaw teeth on right side of sliding member engage similar teeth in extreme right-hand gear for producing the third speed, which gives a direct through drive from one end to the other of lower shaft.



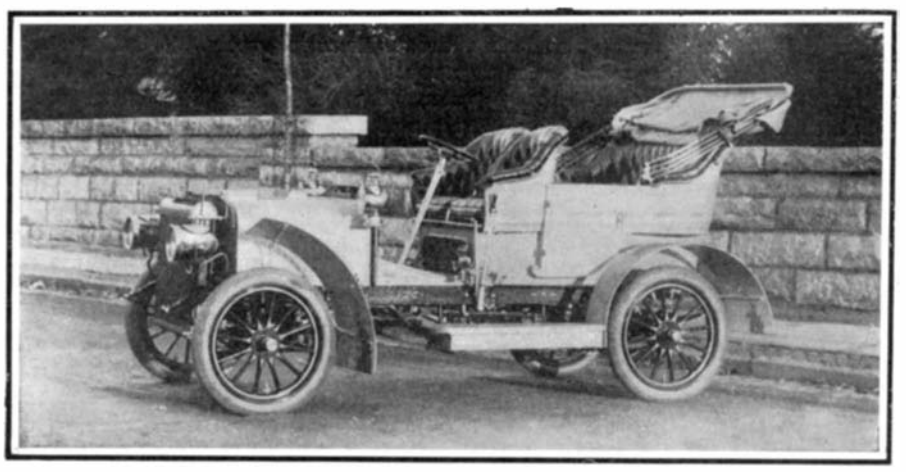
THE 32-38-HORSE-POWER ROYAL TOURIST, WHICH WAS DEVELOPED FROM THE VANDERBILT CUP RACER.



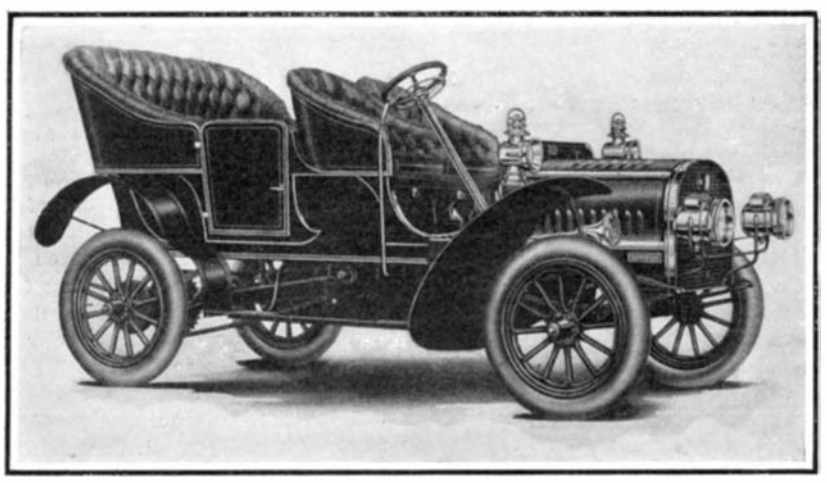
THE 4½ x 5 ROYAL ENGINE, SHOWING BEVEL-GEAR-DRIVEN PUMP AND COMMUTATOR.



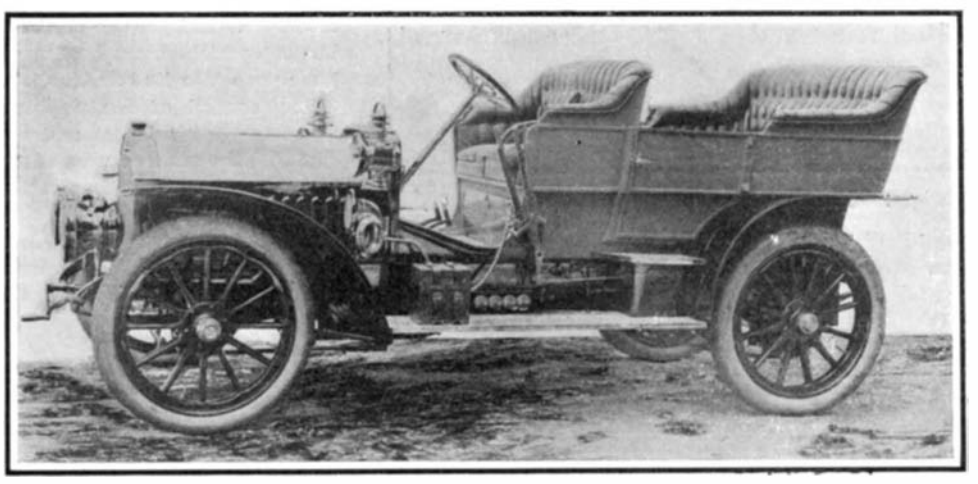
The Haynes 50-Horse-Power Touring Car.



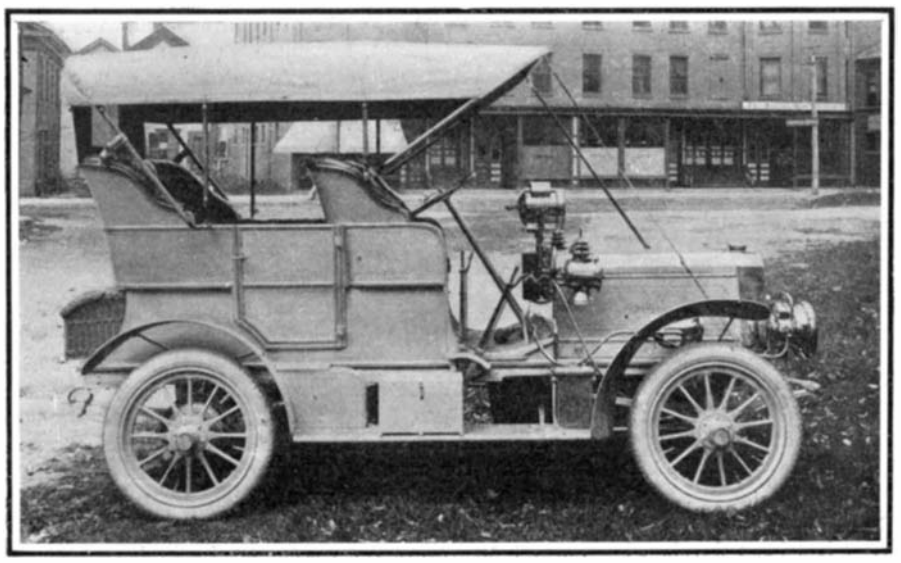
The 1906 Lane Steam Touring Car. This is One of the Few Steam-Propelled Cars Still Manufactured.



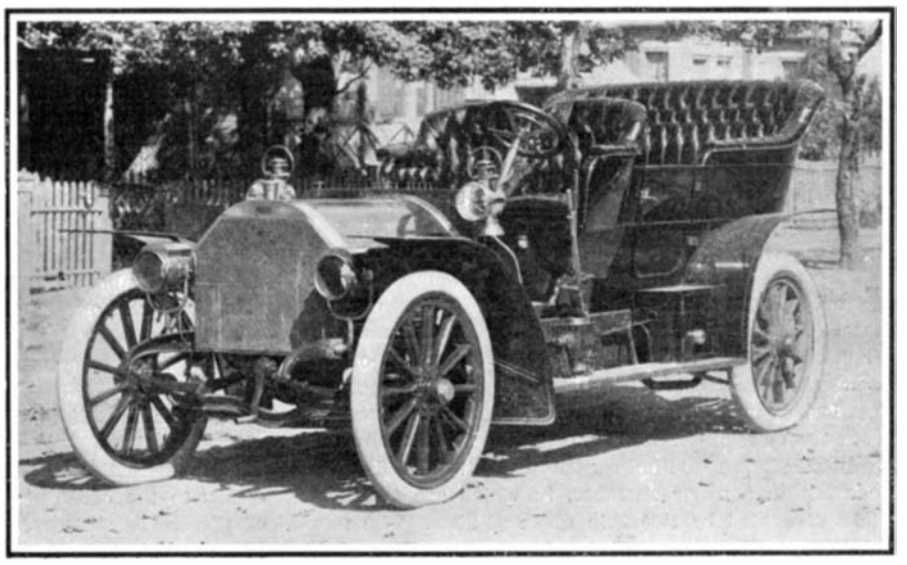
The Rambler 18-Horse-Power Double-Opposed-Cylinder Touring Car.



The 40-45-Horse-Power Columbia Heavy Touring Car.

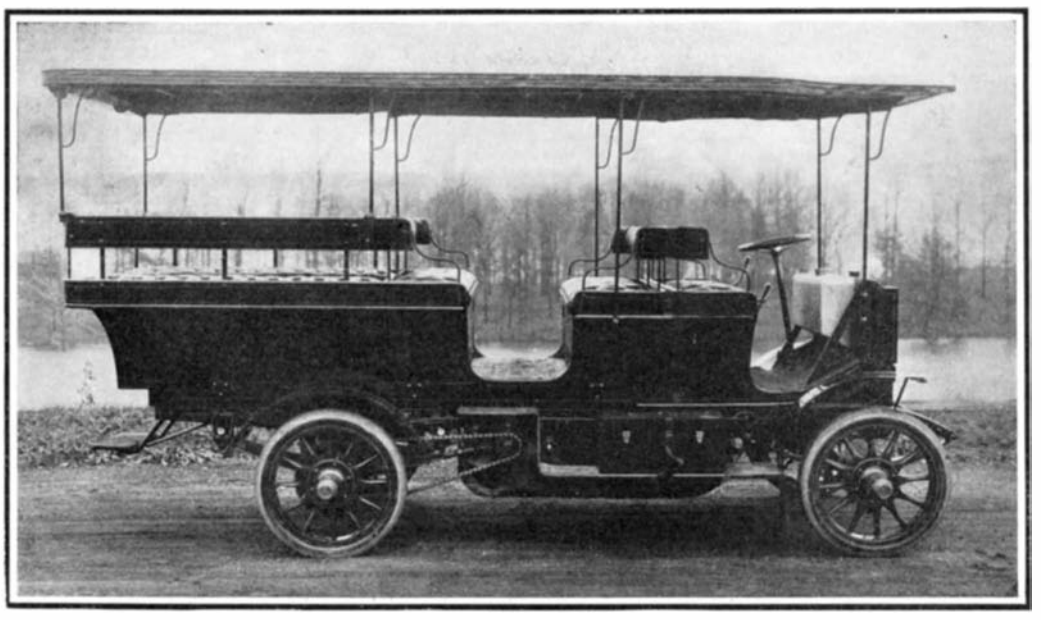


The New Grout 30-35-Horse-Power, 4-Cylinder, Gasoline Touring Car.



The 45-60-Horse-Power New American Mercedes. An Exact Duplicate of the Famous German Machine.

The 16-Horse-Power 1½-Ton Truck of the Rapid Motor Vehicle Company.



The 20-Passenger Oldsmobile Bus Fitted With a 16-Horse-Power, 2-Cylinder, Vertical Motor.

SOME OF THE LARGEST HIGH-POWERED AMERICAN TOURING CARS AND COMMERCIAL VEHICLES.

A NOVEL 4-CYLINDER TOURING CAR.

The new Northern touring car is of the 4-cylinder type. The cylinders and water jackets are all in one galvanized casting, the cylinders being properly spaced to allow of a thorough circulation of water. The bore and stroke of the motor are 4½ x 5. It is rated at 30 horse-power, and, at 900 R. P. M., will drive the car

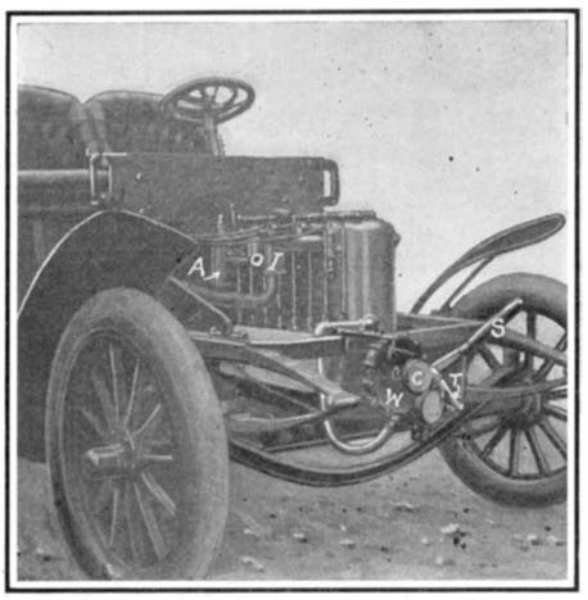


Fig. 1.—FRONT END OF NORTHERN TOURING CAR.

The radiator is removed so as to show parts. *A.* Air compressor. *C.* Contact box. *I.* Inlet pipe. *O.* Carbureter. *S.* Starting lever. *T.* Water pipe. *W.* Inclosed half-speed gears forming water pump.

at a speed rate of 30 miles an hour. The crankshaft is offset slightly from the center line of the cylinders in order to get a better leverage on the power stroke, and the same practice is followed with the cam shaft, which is placed at one side of the valve stems instead of directly under them. The engine has liberal hand holes in the base for adjusting the crankshaft bearings. The valves are all in the heads, and are operated mechanically by tappets and push rods. The eight rods can be seen on the left side of motor in the cut. The carbureter, a small float-feed affair, is fastened to the inlet pipe, *I*, at *O*. No special water pump is used, the inclosed 2-to-1 gears at the front end of the motor being made to serve this purpose. The water pipe is shown running from the base of the forward cylinder to the incased gears. The pipe, *W*, on the other side conveys the water to the radiator, and thence to the water jacket. The radiator, which is not shown in this view, is placed as usual in front. The commutator is located at *C* on the same shaft with the 2-to-1 gear. It is readily accessible, as can be seen. While these are novel features, they are by no means the only original ones about the car, for the control, clutch, and transmission are all along novel lines. An air compressor (*A*, Fig. 1) is driven by a crank on the camshaft. A valve on top makes it possible to obtain any desired pressure up to a certain point. A pipe runs from the compressor to the forward end of the crankshaft, which is made hollow throughout. The flywheel contains an annular chamber, in which are two steel disks separated by two thin disks of fiber. The rearmost steel disk is connected to the propeller shaft through a universal joint. Both disks, as well as the joint, are thoroughly inclosed and protected. The chamber in the flywheel is air-tight, and by admitting the air pressure between the disks it locks them to the

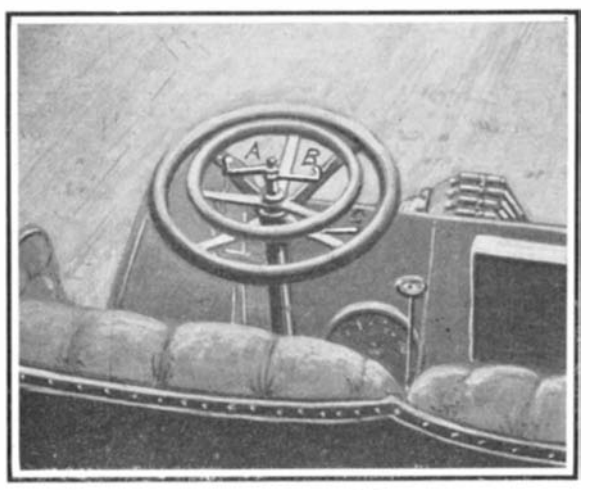


Fig. 2.—CONTROL APPARATUS OF NORTHERN CAR.

The gears are shifted by the smaller wheel within the steering wheel. *A.* Spark handle. *B.* Clutch handle. *C.* Throttle and air brake handle.

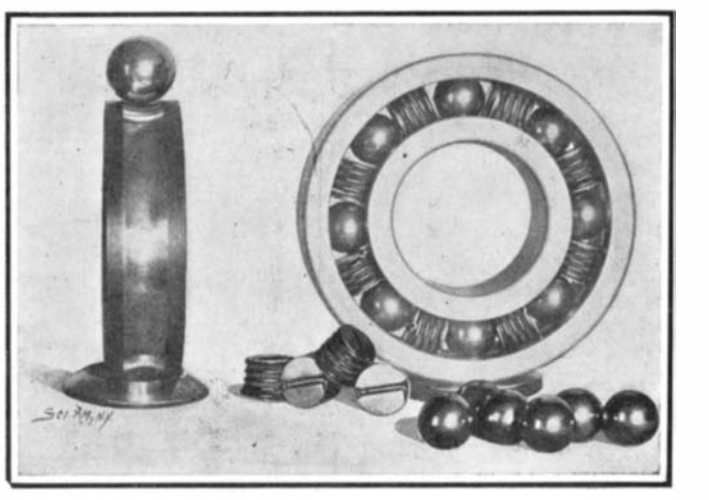
flywheel, which then drives the propeller shaft. The disks are 11 inches in diameter, and with 75 pounds air pressure, three tons driving pressure is obtained in the clutch. By opening the air valve a little at a time, the clutch may be made to take hold very easily and without any jerks. The transmission is located just in front of the rear axle, and the only connection, in addition to the propeller shaft, which it has with the front of the vehicle is a single rod for shifting the gears. This rod is connected so as to be operated by a smaller wheel within the steering wheel. The reverse is obtained by depressing a pedal on the steering column. It is impossible to throw the reverse into action unless the gears are in neutral position. The great strength of the rear axle and the wide band-brakes employed on the hub of the rear wheels can both be seen in Fig. 3, which also shows the long muffler tubes extending nearly the whole length of the body underneath the same. The band brakes are operated by compressed air, and are very powerful. The bands are 3½ inches wide. Inside the brake drums are expanding ring brakes 3 inches wide. These are operated by a pedal, and are to be used in case of emergency.

Still another novel feature of the new Northern touring car is the lever starting apparatus shown in Fig. 1. This consists of a long lever having a pawl engaging with a ratchet-toothed wheel on the motor shaft, and thus making it possible to turn the motor over easily by a series of pulls straight from the shoulder, instead of having to swing a large crank. Grease cups on the bolts of the springs keep these properly lubricated at all times. This is one of the minor details of the car, but one which shows how much thought and ingenuity have gone into its construction.

The control of the machine is almost entirely by the three small levers and the two wheels shown in Fig. 2. The smaller wheel, as previously stated, shifts the gears and gives the first, second, and third speeds forward. A direct drive is obtained on the high speed. By turning this wheel back to the neutral position, and depressing the pedal at the base of the steering column, the reverse is obtained. The small lever, *B*, operates the clutch, while the lever, *A*, is for advancing or retarding the spark. Below the steering wheel is the throttle lever, *C*. Moving this forward opens the throttle, while moving it backward closes the throttle and applies the air brakes. Thus it can be seen that the car is controlled almost entirely by the back-and-forth movement of this one lever. The location of the steering column on the left side of the car is an advantage in passing through traffic, as it enables the driver to see what is in front of him before turning out for a vehicle. Furthermore, when approaching a curb, the empty seat is always next to the latter, and it is not necessary for the car to be turned around. The weight of this car is approximately 2,300 pounds, and the speed possible to obtain with it is in the neighborhood of 50 miles an hour. The car has a wheel base and a body capable of accommodating five people. It is shod with 32 x 4-inch tires. Besides this new car, which is constructed under the patents of Charles B. King, the Northern Manufacturing Company still builds its double-opposed-cylinder touring car and its single-cylinder runabout. A feature of the former car is the use of interchangeable bodies, which makes possible a closed Limousine for winter, or an open side-entrance tonneau for summer use.

A SILENT NON-ADJUSTABLE BALL BEARING.

Ball bearings were originally used on some of the first automobiles constructed in this country; but owing to the constant trouble which they gave, most of the makers discarded them. During the last two years a new type of ball bearing has been developed in Germany, and has found its way into use on many of the leading foreign cars. Owing to the fine quality of steel used in its manufacture, and to the great care with which the balls are examined and tested, this bearing has shown itself to be very reliable under almost all conditions. Its friction is so small that the loss amounts to only 1-8 or 1-6 of one per cent of the total load carried, instead of from 3 to 5 per cent; while the starting friction is no greater than the friction when running. The new bearing consists of two annular ball races, each of which is in one piece. By placing the outer ring in a position eccentric to the inner one, the balls can be slipped into place with the coiled springs between them. The latter keep the balls separated, so that there is no clicking sound as they drop over the top of the bearings, such as is the case with the ordinary bearing. A wool pad placed inside the spring absorbs sufficient oil to keep the balls lubricated for long periods. The balls and races are made from a special high-grade steel. Both are very hard and tough, and have a high polish. Numerous tests are constantly made of sample sets of bearings, in order to be certain that the quality is maintained and in order to improve, if possible, this quality. As the result of such tests the manufacturers have discovered a new steel alloy that allows the load on the bearings to be doubled. But one ring of balls is used in any bearing, the result being that the space required is much smaller than is usual. The fewer balls used also tend toward simplification. These bearings are used almost universally in the transmissions and wheels of high-grade cars. The Daimler Company has become a convert to their use on the engine crankshaft, and both the Mercedes and Hotchkiss machines use them in this important part. Their high efficiency and the little attention which they require make them ideal for automobile service.



THE HESS-BRIGHT NON-ADJUSTABLE SILENT BALL BEARING USED ON MANY HIGH-GRADE TOURING CARS.

The Current Supplement.

Jacques Boyer opens the current Supplement, No. 1567, with a most thorough article on the methods

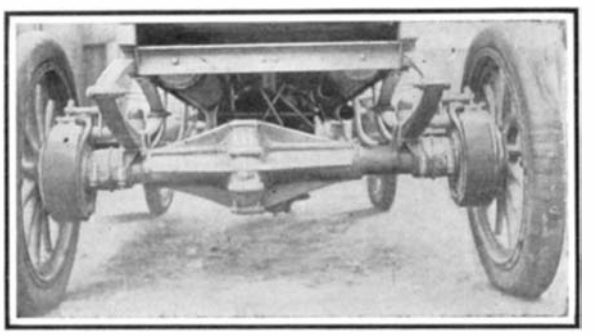


Fig. 3.—NORTHERN REAR AXLE.

The wide band brakes are applied by compressed air. Expanding emergency brakes are connected with a pedal. The long muffler tubes can be seen on each side beneath the body.

employed in France for fattening fowls. Wonderfully sharp and clear photographs accompany his text. John C. Sparks gives some wholesome advice on the subject of boiler compounds. Of the interesting features of modern constructive practice which call for appraisement, either from their extreme novelty or successful application, none holds so high a place as the remarkable adaptability of armored concrete to the many and varied engineering requirements of the times. For this reason Lieut. Henry J. Jones's thorough discussion of the subject will doubtless be read with interest. Sir Oliver Lodge, in a most striking paper entitled "A Pertinacious Current; or, the Storage of High-Tension Electricity by Means of Valves," shows how it is possible to dissipate fog or smoke or to deposit metallic fumes. A tunnel was recently bored through the Santa Cruz Mountains which is of engineering interest, inasmuch as it is approached at one end through a concrete retaining wall or dam that has stood for over eleven years without the least sign of cracks or any failure whatever. Mr. Herbert I. Bennett describes this wall and its method of construction. Prof. A. E. Outerbridge reviews recent progress in metallurgy. The Generation of Ozone by Means of Ultra-violet Light is briefly described.

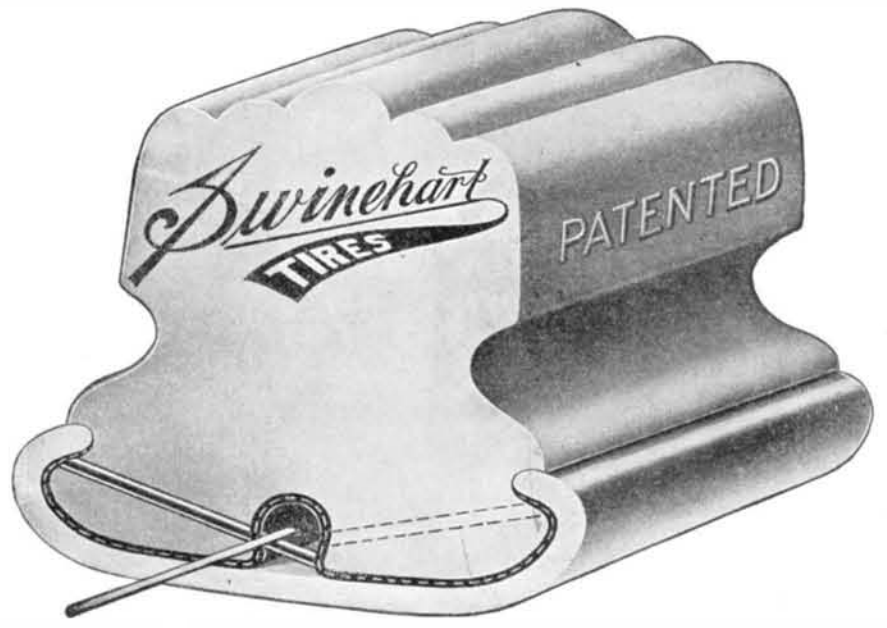
Official Meteorological Summary, New York, N. Y., December, 1905.

Atmospheric pressure: Mean, 30.09; highest, 30.86; lowest, 29.46. Temperature: Highest, 57; date, 3d; lowest, 19; date, 1st; mean of warmest day, 48; date, 3d and 29th; coldest day, 24; date, 15th; mean of maximum for the month, 43.6; mean of minimum, 31.8; absolute mean, 37.7; normal, 34; average daily excess compared with mean of 35 years, + 3.7. Warmest mean temperature for December, 42, in 1891. Coldest mean, 25, in 1876. Absolute maximum and minimum for this month for 35 years, 68, and — 6. Average daily excess since January 1, + 0.2. Precipitation: 3.67; greatest in 24 hours, 1.38; date, 20th and 21st; average for this month for 35 years, 3.40; excess, + 0.27; accumulated deficiency since January 1, — 0.17. Greatest precipitation, 6.66, in 1884; least, 0.95, in 1877. Snow, 0.7. Wind: Prevailing direction, west; total movement, 10.774 miles; average hourly velocity, 14.5 miles; maximum velocity, 64 miles per hour. Weather: Clear days, 8; partly cloudy, 12; cloudy, 11.

Swinehart TIRES

Without SWINEHART TIRES an Automobile is an Uncertain Means of Travel

A TIRE BUILT TO REPLACE THE PNEUMATIC AND CARRY YOU OVER ANY ROAD WITHOUT TIRE TROUBLE— NO EXCESSIVE VIBRATION. THIS TIRE IS FULLY GUARANTEED



CONDITION OF ROADS NO BARRIER TO THESE TIRES. WON'T COME OFF. WILL FIT CLINCHER RIMS. WILL OUTWEAR 3 TO 5 SETS OF PNEUMATICS. WILL ABSOLUTELY ELIMINATE TIRE TROUBLE

REDUCE UPKEEP OF CAR

Over 2000 owners who were formerly prejudiced against solid tires are now staunch friends of the Swinehart Tire and maintain that the machinery of their cars has not been injured in the least and recommend the tires to their friends.

FOR AN UNBIASED OPINION ASK THE USER OF A SWINEHART TIRE

FOR DETAILED INFORMATION WRITE FOR CATALOG "S." UNEQUALLED FOR

DURABILITY RESILIENCY RELIABILITY

The Swinehart Clincher Tire and Rubber Company

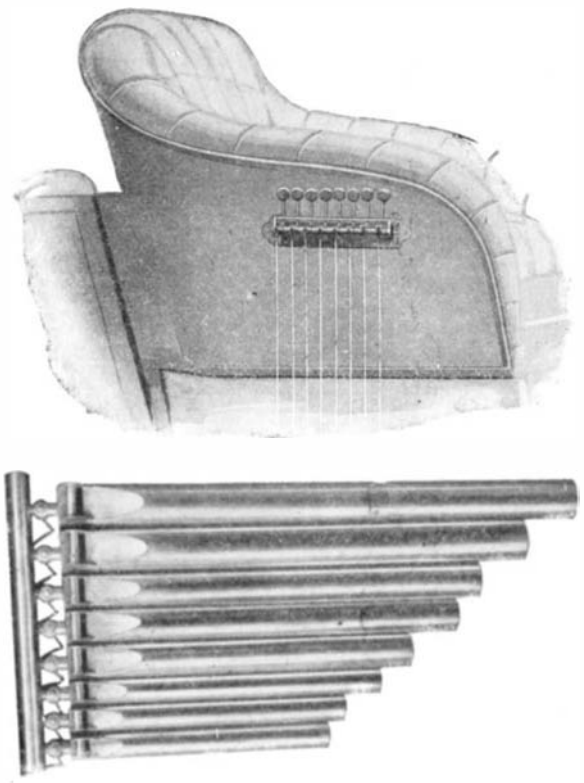
NEW YORK CHICAGO BOSTON
PHILADELPHIA DETROIT BUFFALO
LOS ANGELES OAKLAND DENVER

AKRON, OHIO, U. S. A.

Automobile Novelties and Improvements.

THE GABRIEL HORN.

During the past year many large cars have been fitted with a compound horn, or whistle, giving a musical



EXHAUST-BLOWN HORN SOUNDING AN OCTAVE.

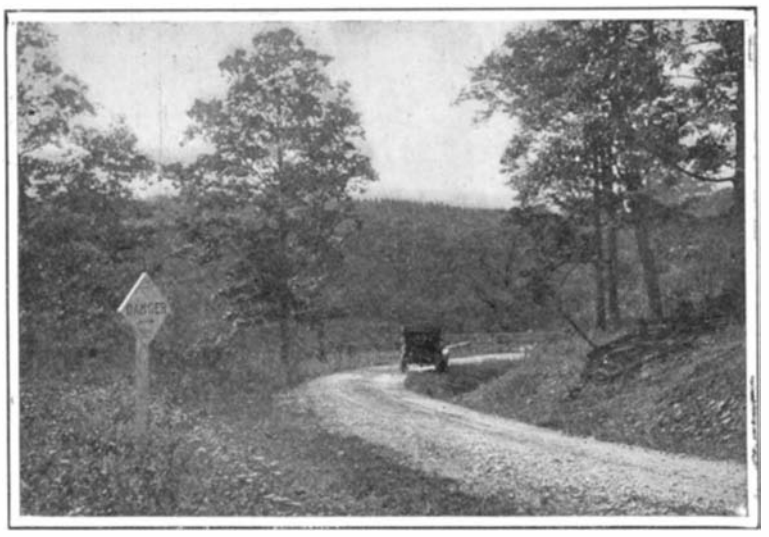
note of varying pitch and intensity. This horn is worked directly from the exhaust pipe of the motor, and it can be applied to any multiple-cylinder car. An improved horn of this type, having eight separate pipes, has recently been put on the market. The new horn is a sort of miniature pipe organ, being operated by a keyboard and being capable of sounding a full octave. The improved horn can be made to play a tune when a musically-inclined person fingers the keyboard.

DANGER SIGNS FOR AUTOMOBILISTS.

More than three hundred accidents to motor-car tourists have been reported in the United States and Canada during 1905, many of them resulting fatally. It cannot be said that these accidents were wholly due to rapid speed or reckless driving, for some of the most serious ones happened to automobilists who are known to be prudent and careful in the management of their vehicles. Most of them could have been avoided by a better knowledge of the danger points, or by some warning by which the tourist could have been advised of the proximate peril. The truth is that in many parts of the country, and especially in those sections which are most picturesque and attractive to the tourist, the highways are too narrow and winding and are often skirted by deep unguarded ditches and dangerous gullies, and crossed by railroad tracks at points where the tourist would have little reason to anticipate them.

To lessen these perils as much as possible, the American Motor League has called upon its consuls, members, and proprietors of official stations, in all the important States where touring is most popular, to take up the work of erecting danger signs and guide boards, by which the tourist may be forewarned and his course directed to the avoidance of these pitfalls. Many of these danger signs have already been put up, and the Pittsburg Board of Consuls of the American Motor League has been particularly active in western Pennsylvania in putting this work in evidence. The league sends out stencils, from which these signs can be easily made by a man of ordinary skill, and in some cases the completed signs are sent out ready to be put up.

Blanks are being sent to automobilists in several States, with letters requesting information as to points where these signs should be erected, and a contract has been made with a firm in central New York for a large number of signs, which will be put up in place within the next few months. It is believed that before the end of 1906 more than three thousand of these signs will be placed in different parts of the United States.



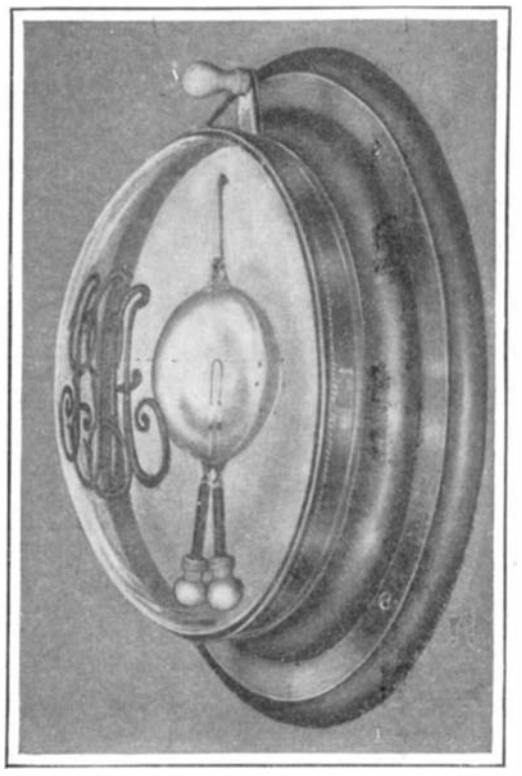
ONE OF THE AUTOMOBILISTS' ROAD SIGNS THAT ARE BEING LOCATED IN DANGEROUS PLACES.

ELECTRIC LIGHT FOR CLOSED CARRIAGES.

The little lamp shown herewith is intended to be used in the roof of a Limousine or other closed body, and to be run from the ignition accumulators with which all large cars are supplied. The lamp is fitted with a silver-plated reflector mounted in a supporting ring. In front of the reflector an incandescent lamp of special design is hung on silver springs mounted in ivory bushings. An oval, beveled, plate-glass cover locks on the rim, and effectually protects both lamp and reflector. The initials of the owner of the car can be cut in this cover, if desired. The lamp is intended to be placed horizontally in the roof of the vehicle, and not in the position shown in the cut. The hanging of its bulb on springs makes the latter specially durable for automobile service. Although the light is shown here with a switch upon the base, it is usually wired with a switch in some convenient place where it can be readily reached when one wishes to turn on the light. If it is necessary to run the wires on the surface of the woodwork, a polished wood back of mahogany or oak with grooves for the wires can be used. The lamp is about six inches in diameter, and projects about two inches from the roof of the carriage. It is adapted for a four, six, or eight-volt set of accumulators, and will furnish from four to eight candle-power, according to the bulb that is used. Another convenience about a car is a small electric light on a flexible cord, for use in case of a breakdown.

NEW SPRING WHEELS.

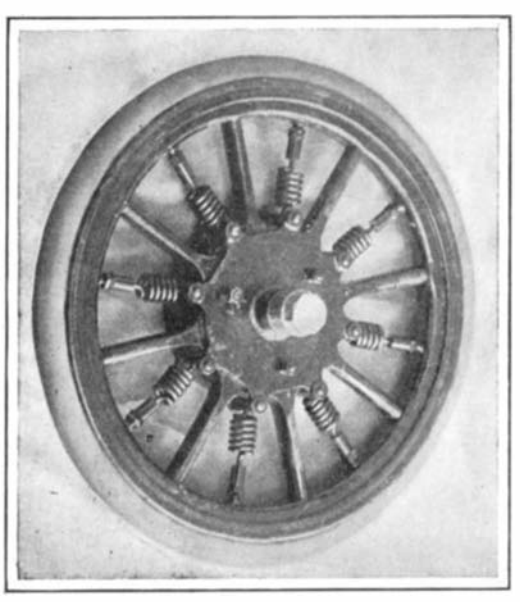
Among the new spring wheels which are coming out in France we note the S. Guigner wheel. It is manufactured by Bourgine & Lebon, of Parthenay. It has a central wood disk which carries the spokes, also of wood, and upon the wood disk are placed two metal plates carrying the axle, but being independent of it and able to allow for the play required by the springs.



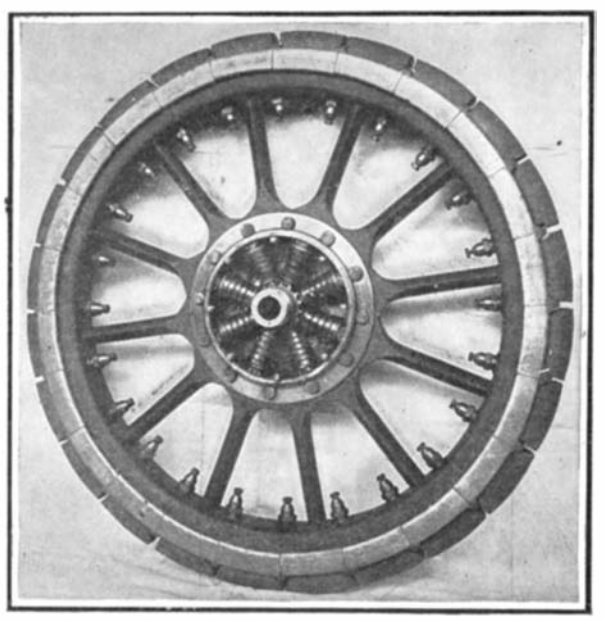
CEILING LIGHT FOR CLOSED CAR.

The two metal plates completely cover the wood disk on both of its sides and are joined by three bolts. The wood disk has large openings which allow the bolts to pass through. The metal plates are also connected at the rim by eight cross-pieces carrying the springs. The elasticity of the system is obtained by coiled springs which connect the two metal plates with the inner rim of the wheel. The springs are attached to the rim by a special device which seems to hold them in place and also to regulate the tension. The springs can be taken off in a few seconds. Owing to this construction, the car is suspended to a certain extent at the center of the wheels by means of the coiled springs, which work by traction and by compression and give a good effect in deadening the shocks. The center of the wood disk has an opening which allows the axle to take the necessary play. The three bolts connecting the two plates carry washers or separating pieces for the plates, and at each side of the bolts is a rectangular cavity in the wood piece which carries a coiled spring working against the bolt by compression, or else a rubber block serving the same purpose, so that we obtain a deadening of the shock at the time of sudden starting or a quick stop. To complete the elasticity of the system the central part of the wheel carries a heavy rubber washer or cylindrical piece which is used to complete the action of the springs at exceptional times, under a very heavy shock. By the above combination the inventor claims a very great ease of movement combined with all the desired rigidity of the wheel. The expense of keeping it in order is reduced to the changing of the rubber tires, which are solid, and it is recognized that a good solid

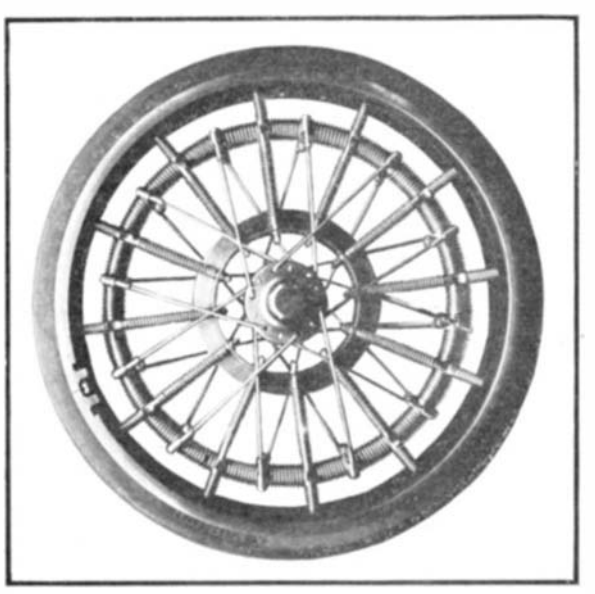
(*Continued on page* 38.)



WHEEL WITH FLOATING HUB SUSPENDED BY COILED SPRINGS FROM THE RIM.



WHEEL FITTED WITH SECTIONAL TIRE AND SPECIAL SPRING-SUPPORTED HUB.



WHEEL WITH AN INTERNAL SPRING DRIVING WHEEL.

SOLAR LAMPS

THEY CUT LIKE A KNIFE THROUGH THE GLOOM AND DARKNESS

EVERY MAN WHO DRIVES AT NIGHT MUST HAVE A GOOD CAR AND A BETTER LIGHT

LET THE SOLAR LIGHT YOUR WAY

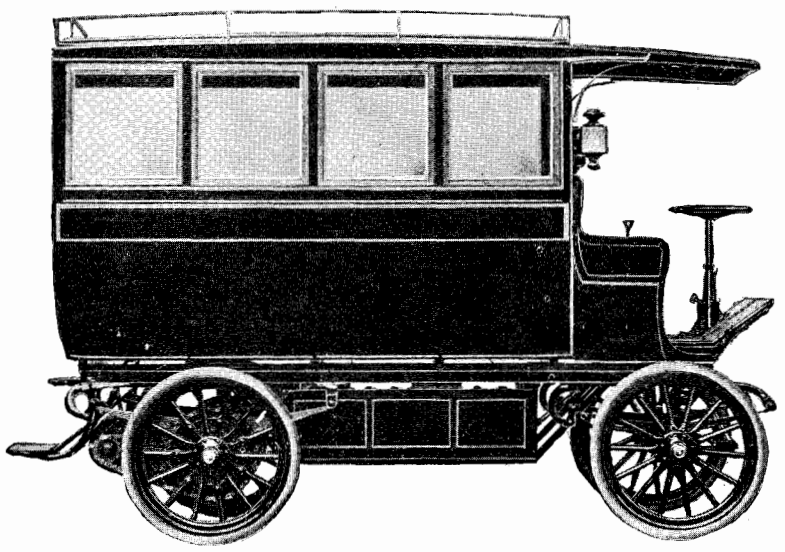
THAT'S THE SOLAR

GET OUR BOOKLET OR ASK YOUR SUPPLY MAN

BADGER BRASS MFG. CO.
KENOSHA, WIS.

NEW YORK OFFICE, 11 WARREN ST.

STUDEBAKER



14-Passenger Electric Omnibus, Model 2012

THIS 14-passenger Electric Omnibus is a type of car we are building extensively for hotels and resorts. In impressive appearance and luxurious comfort it surpasses every previous style of omnibus.

It is constructed both in materials and mechanism according to absolutely reliable Studebaker standards, and has given a grade of service highly satisfactory to the many establishments who are operating it.

Studebaker Electrics do not run up repair bills. Send for a list of the well known users of the 14-Passenger Omnibus

CATALOGUES ON REQUEST

Studebaker Automobile Co.

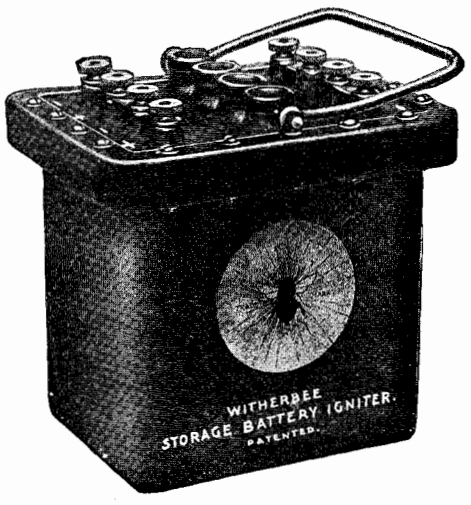
Factory and Executive Offices, SOUTH BEND, IND.

Repositories— New York City, Broadway and 7th Avenue, at 48th Street—Chicago, Ill., 378-388 Wabash Avenue—Kansas City, Mo., 810-814 Walnut Street—San Francisco, Cal., corner Market and 10th Streets—Portland, Ore. 330-336 E. Morrison Street—Denver, Colo., corner 15th and Blake Streets—Salt Lake City, Utah, 157-159 State Street—Dallas, Texas, 317-319 Elm Street—*Local Agents Everywhere*

Witherbee Storage Battery Igniter

Now Used and Endorsed by 48 of the Leading Automobile and Motor Boat Manufacturers.

Can you afford to consider anything else for your '06 Car?



"Every Battery Guaranteed, Every Customer Satisfied." Over 12,000 Batteries now in use. Suitable for any Automobile Engine using Make and Break or Jump Spark Ignition.

Recognized as the Most Satisfactory Means of Ignition.

Every Battery Guaranteed to give Satisfaction or Purchase Money Refunded.

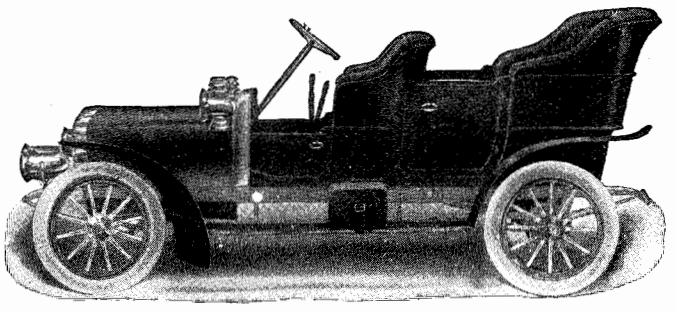
When ordering your Car insist on having the WITHERBEE and avoid all ignition troubles.

Endorsed by the Leading Manufacturers. Sold by the Leading Jobbers.

Write for Descriptive Pamphlet.

WITHERBEE IGNITER CO.

541-543 West 43d St., New York



The car of to-day, to-morrow and for years to come.
Built by practical men—

Aerocar

The ONE motor car driven by a reliable, test-proven air-cooled motor.

The motor car is not an every-day purchase. It costs considerable money, and if it does not run satisfactorily it is of little value.

There must be a good motor to make a good automobile. Water-cooled motors have many troubles—the perfect water-cooled motor has yet to come.

The perfect Air-cooled motor is here. It is the air-cooled motor of the **Aerocar.**

Because of its wonderful efficiency in power; because of the saving in weight; because of simplicity and strength in mechanical construction; because of its uniformly smooth working—runs steady with the rhythm of an electric dynamo;—because it is the same reliable sure-working motor under all climatic conditions, midsummer or midwinter makes no difference, there's nothing to freeze nor nothing to thaw;—because of ease of control, economy of maintenance; because it will develop continuous higher power, for weight, and give greater speed than any other motor; because of its assured reliability and greater durability of service.

The body of the **Aerocar** compares most favorably with any other automobile, either foreign or American. It embodies the best features of each, is graceful in design, is most comfortably roomy, is luxuriously upholstered, and finished along the strictly high standard of up-to-date demands.

We courteously ask the opportunity to give a practical demonstration of the superiority, in every way, of the **Aerocar.** Try before you buy. Know why before you put money in a motor car.

Aerocar 1906. 24 h. p. Four cylinders. Five passengers. 45 miles an hour. 104 inch wheel base. Shaft drive. Sliding gear transmission. Three speeds and reverse. Leather-faced cone clutch. Hollow steel dash. Four sight lubricator on dash. Tool box on running board. 34 x 4 tires. 9-inch road clearance. Weight 2,000 pounds. Fully equipped, ready for the road, including two large glass headlights, $2,800 f. o. b. Detroit.

Will be exhibited and demonstrated at the Automobile Shows in New York and Chicago. Write for descriptive literature G.

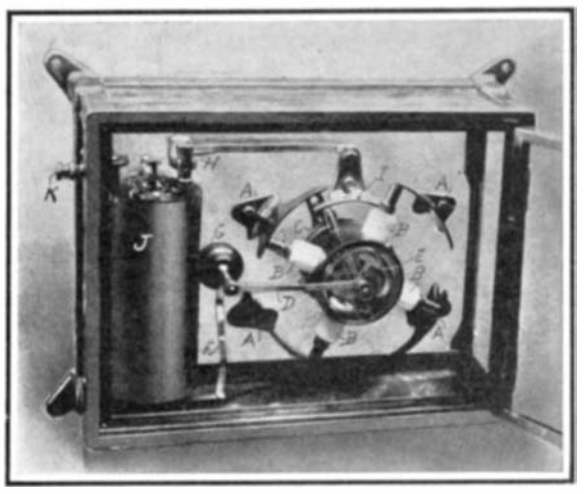
The Aerocar Company, Detroit, Mich.

NEW SPRING WHEELS.

(*Continued from page 36.*)

tire will run from 10,000 to 12,000 miles upon fairly good roads without needing repairs. The weight of the Guigner wheel is from 70 to 100 pounds, according to the size, and at present it is made in 30 to 38-inch sizes.

Another interesting effort to grapple with the problem of obviating the disadvantages inherent in pneumatic tires is the invention of Mr. George Middleton, of London. In this device, instead of the wheel rims being shod with pneumatic tires, the air cushion is inserted round the hub of the wheel, so that the wheel proper has no rigid connection with the axle or driving medium. This device has been thoroughly tested with a 15-horse-power Panhard car, the wheels of which



A NOVEL DASHBOARD IGNITION OUTFIT.

were fitted with it and shod with solid tires. Over 15,000 miles have been covered, and the system has proved fairly successful. The degree of resiliency is of course not equal to that of pneumatic tires, but it has the surety that a puncture is a very remote possibility. Should, however, the air cushion break down, the car can still be safely run to its destination where the defective tube can be repaired. Access to the tube can be effected quickly and easily since the outer flange is made removable for this purpose. Several high-powered cars have already had this pneumatic hub fitted to the driving wheels, so that the latter can be shod with solid tires, and the conversion has proved completely successful.

A wheel having a hub somewhat similar to the above-described wheel, but in which the hub is supported on springs instead of on a pneumatic tube, is also shown at the bottom of page 36. This wheel is provided with a solid tire put on in sections, which are held to the rim by special binding screws. The arrangement is a compact one and it has a very neat appearance.

A somewhat more complicated wheel, designed for a like purpose, consists of a hub tied by tangent spokes

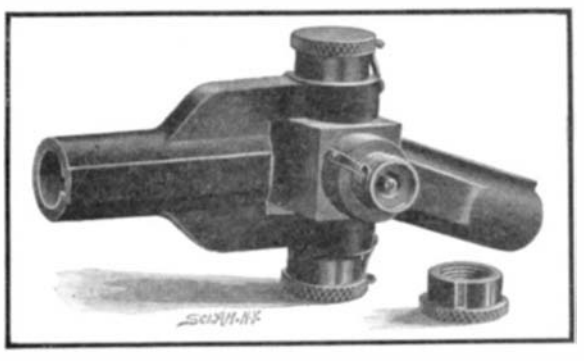


Fig. 1.--UNIVERSAL JOINT ASSEMBLED.

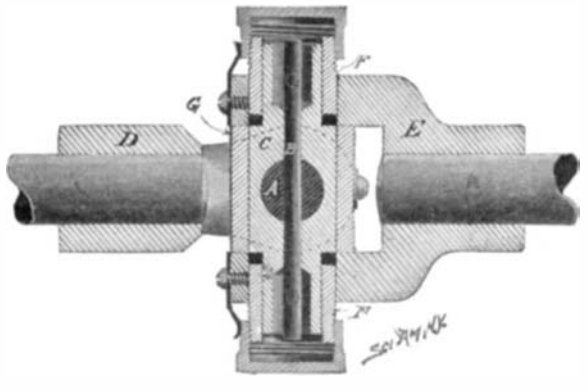


Fig. 2.—SECTION THROUGH JOINT.

to a ring surrounded by an annular coiled spring, and situated within the rim of the wheel. This ring is straddled by twelve radial rods connecting the rim of the wheel with a metal ring surrounding the hub, and these rods also have coiled springs acting under compression. The inner ring having the annular coiled spring may be considered an inner driving wheel, for as the axle begins to turn, the spring is compressed against the radial rods or spokes, thereby giving a spring-drive to the rim. The straight coiled springs which run to the rim act as shock absorbers or spring cushions which take the place of pneumatic tires.

Roman Antiquities Discovered in London.

Another section of the ancient Roman wall has been brought to light during the construction of a factory in the City of London. The unearthed relic measures 20 feet in length by 7 feet in height. Owing to its extreme antiquarian interest, the wall is not to be demolished, but is to be left in position, the new factory being built around it. It will then project about three feet into one of the rooms on the lower ground floor. To protect the wall from crumbling under the vibration of machinery and other causes, it is to be inclosed in a galvanized-iron netting similar to that around the Roman remains at the London Coal Exchange. In the course of other excavations upon the site for a fire station in Cannon Street, a Roman bath was unearthed. The relic is in a perfect state of preservation and is quite complete. It measures inside 10 feet 6 inches in length by 6 feet 3 inches wide, and weighs about seven tons. This monument has been removed intact, and will eventually be placed in a museum.

A DASHBOARD IGNITION OUTFIT.

In the Mosler ignition device, illustrated herewith, all parts of the electric system of an automobile except the batteries, spark plugs and connecting wires, are carried in a brass-framed glass case attached to the dashboard. The case contains the coil, a primary interrupter, and a secondary distributor, and these are always visible, thus permitting adjustments and repairs with little loss of time.

The wire from the batteries connects through the binding post, *K*, with the primary of the coil, *J*, while the other end of this winding is joined through the contact, *H*, with the fixed sector, *I*, on the rear wall of the case, *I* being connected through the brush post, *C*, with the four segments of the primary interrupter. The primary circuit is completed through the grounded shaft and car body to the batteries.

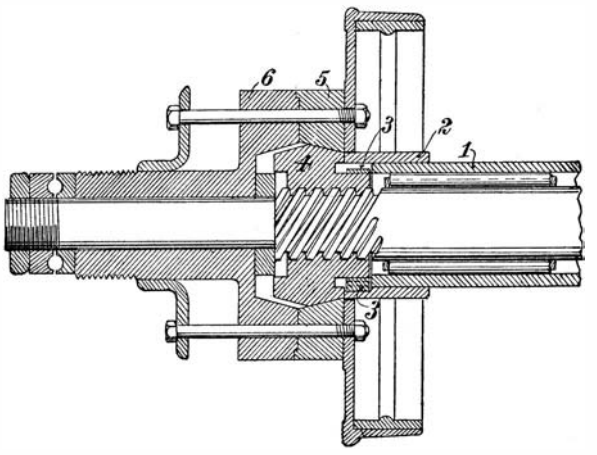
One terminal of the secondary coil winding is grounded through the same post as the primary, while the other connects with a brass strip, *F*, carried by the hard rubber support, *G*. From this the current is carried to a central terminal, *E*, of the distributor by a movable flexible rod, *D*, which is so hinged at the bracket end that it can be swung from the terminal, *E*, to permit the opening of the circuit. The high tension circuit from *E* is through revolving ball contact with the rotating T-shaped brush. The outer ends of the four high-tension terminals which are inclosed in the insulations, *B*, are in direct contact with the four segments, *A*. These are secured to the rear panel of the casing and are connected to the four wires to the spark plugs.

AN IMPROVED UNIVERSAL JOINT.

A universal joint has recently been invented, which is so designed that it can be taken apart without the use of tools. One of our illustrations shows the complete joint with one of the grease cups removed, while the other is a section which clearly shows the novel construction. It will be observed that the joint comprises a central cubical block, *G*, through which passes a shouldered pin, *C*. A hole is drilled transversely through this pin and the block to receive the pin, *A*. A small locking pin, *B*, passes lengthwise through the pin, *C*, and transversely through pin, *A*, serving to hold them together in proper relative position. The projecting ends of these pins find bearings respectively in the forks, *E* and *D*, which are carried on the two sections of the shaft. Bushings, *F*, are driven into the holes in the forks, and the threaded ends of these bushings carry the grease cups. Spring stops on the forks press against the cups to prevent them from working off the bushing. Packing rings at the bottom of the bushings prevent the escape of the lubricant, which is kept in holes drilled in the ends of the pins, *A* and *C*. When it is desired to take the joint apart, two adjacent grease cups are removed. The pin, *B*, is then removed, permitting the pin, *A*, to drop out, whereupon the joint falls apart.

WHEEL CLUTCH FOR USE WITH A SOLID REAR AXLE.

Many attempts have been made by inventors to devise some sort of a clutch for use on the rear axle of an automobile, which would do away with the complications and deficiencies of the differential gear. We illustrate herewith a simple clutch which appears to have solved the difficulty. The rear axle turns on roller bearings, carried by the housing, 1. The sleeve, 2, on this housing carries a friction band, 3, which is mounted on the hub of the nut, 4, and is free to move in and out with this nut. The nut engages a thread on the axle. It will be observed that the periphery of the nut is formed with inclined faces adapted to engage one or other of the clutch faces on the hubs, 5 and 6. The illustration shows the nut engaging the "go-ahead" clutch, 5. If, as in rounding a curve, the outer wheel travels faster than the axle, it tends to feed the nut out to a neutral position between the two faces. When the motion of the axle is reversed, the thread feeds the nut back against the clutch, 6, and then again, if the wheel travels faster than the axle, the clutch feeds the nut in far enough to disengage the clutch faces. As a result of this construction, the wheel which is doing the harder work receives more power, whereas with a differential axle the wheel which is doing the less work is favored at the expense of the other. An extreme example is that of a machine equipped with a differential axle standing

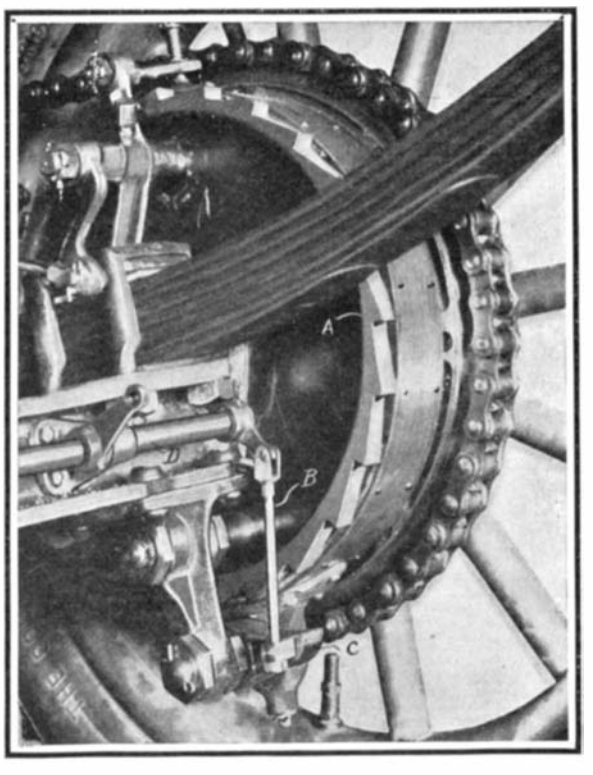


AUTOMATIC WHEEL CLUTCH MAKING POSSIBLE A SOLID LIVE AXLE.

with one wheel on dry pavement and the other on a muddy or wet spot. The latter wheel will spin idly around while the other remains stationary. The improved axle here shown would make both wheels turn at the same speed, expending the greater power on the wheel which engages the dry ground.

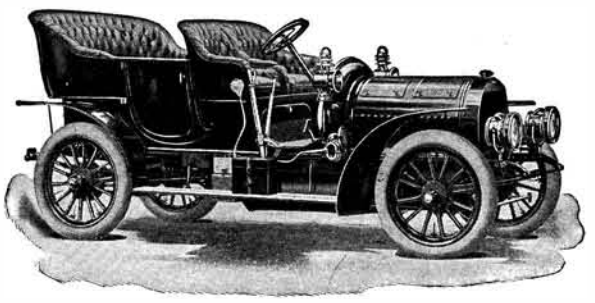
THE THOMAS SAFETY RATCHET DEVICE.

One of the most striking features of the Thomas car is a safety ratchet device arranged on the brake drums of the rear wheels and having for its object the instant stopping of the machine should the brakes fail to hold and the car start to run down hill backward. By the movement of a small lever placed on the dash, the driver rotates the rod, *D*, and, by means of the connection, *B*, draws up the pawl, *C*, against the ratchet-toothed ring, *A*. *C* is held against *A* by means of a spring suitably connected in the system, with the result that if the car is backing, it is instantly brought to a standstill and its passengers are saved from disastrous results. This device is a valuable one, and should be placed on more of the large touring cars, as failure of the brakes in a critical moment is one of the troubles to which such cars are prone. The



THOMAS SAFETY RATCHET DEVICE FOR STOPPING A CAR FROM BACKING DOWN HILL.

1906 Thomas is as commodious a car as heretofore. It has a 5½ x 5½, 4-cylinder, 50-horse-power motor, 34 x 4½-inch tires, a 118-inch wheel base, and weighs in the neighborhood of 3,000 pounds. Every car is sold under a guarantee that it will develop a speed of 60 miles an hour.



The wonderful motor in each Royal Tourist is exactly the same as the one that ran away from most of the racing cars in the Vanderbilt Elimination Race.

COMFORT *SPEED* *SAFETY*

40 H. P. *1906 Model G* *$3,500*

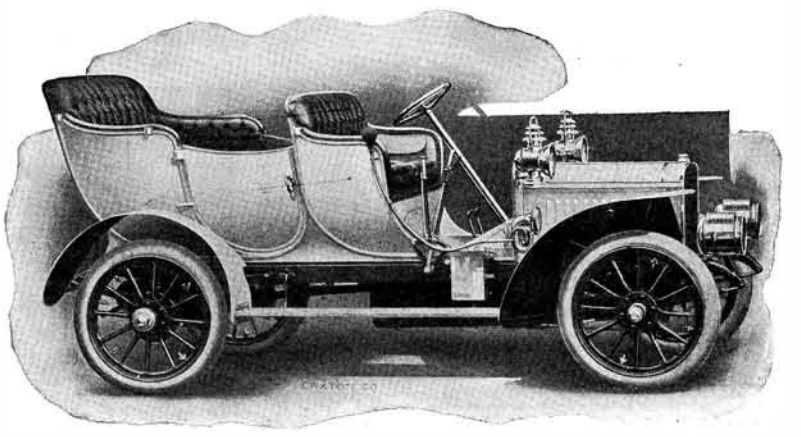
ROYAL

The Royal Motor Car Company
Cleveland

Member A. L. A. M. Send for Catalogue

Cleveland

Model F
30-35 H.P.
5 to 55 miles per hour on third speed. Guaranteed for one year



SHOWING THE CLEVELAND MODEL F EQUIPPED WITH STANDARD VICTORIA BODY
TULIP BODY FURNISHED IF DESIRED

The buyer of a MODEL F CLEVELAND can safely eliminate the cost of repairs as a factor. Its economy is a tangible asset, due to harmony of strength, design and construction.

The repairs on fifty 1905 cars in constant use averaged $4.00 including time. One Boston car ran 6,000 miles at a repair expense of $3.90. One New York car 9,000 at a repair expense of $6.00—$4.00 of which was for spark plugs.

The CLEVELAND has real, solid, tested, standing-up ability. The complete chassis is made by the Garford Company—the largest manufacturers of exclusively high grade automobile parts and chassis in America. *It has no weak spots—we guarantee you against them.* Price $3,500 to $5,000, depending upon body equipment.

The ignition is by the imported Simms-Bosch low tension Magneto, with which all important foreign cars are equipped. The spark is make and brake and controlled by the speed of the engine—doing away with the spark plugs, coils, intricate wiring and batteries.

The carburetor is automatic and requires no adjustment. It will not flood. The exhaust on the muffler prevents dust from coming in the rear of the car.

Our catalogue illustrates and describes in detail the wonderful mechanical construction which makes the CLEVELAND a year ahead in American Automobile building. FREE on request.

CLEVELAND MOTOR CAR COMPANY

Dept. 15, Cleveland, Ohio

New York: E. B. Gallaher, 228-230 West 58th Street
Gen'l Eastern Distributing Agent

Boston: Butler Motor Car Company, 998 Boylston Street
So. California: A. P. Worthington, Los Angeles

New York Automobile Show, 69th Regiment Armory, Space E-2
Chicago Show, 1st Regiment Armory, Space A-25 and 26

REO

REO 1906 Touring Car, 16 h. p., 1600 pounds, 90-inch wheel base, 5 passengers, side door detachable tonneau. Speed 35 miles per hour, $1250

The Car That Did. The Car That Will.

No cars have ever scored a more remarkable series of real victories than was won in their first short season by REO Cars.

In the great six-day Economy test they won the First and Second Gold Medals and three other prizes: Five out of seven.

In this test a REO car carried its load **nearly 200 miles;** at a total cost of 35 cents a passenger.

On Paddock Hill, Cincinnati, a **REO** Touring-car won three cups in one day, beating all of the twenty competing 4-passenger gasoline cars; including eight of the 24-horse power rating and double the REO'S price.

In the Los Angeles Dealers' Run; in the Glidden Tour; in the Mt. Washington "Climb to the Clouds" and on the Syracuse and Empire City race tracks REO cars broke the reliability, economy, climbing and racing records; and leapt at one bound into the front rank of star performers.

REO cars stand up to practical every day work without trouble or complaint.

What REOS have done REOS will do.

Write for the REO book that tells why.

REO 1906 Runabout, 8 h. p., 900 pounds, 2 passengers, 25 miles per hour. $650. With folding seat, $675.

We exhibit at the Old Show in the New Armory, January 13th to 20th.

REO Motor Car Co., Sales Department, Lansing, Mich.

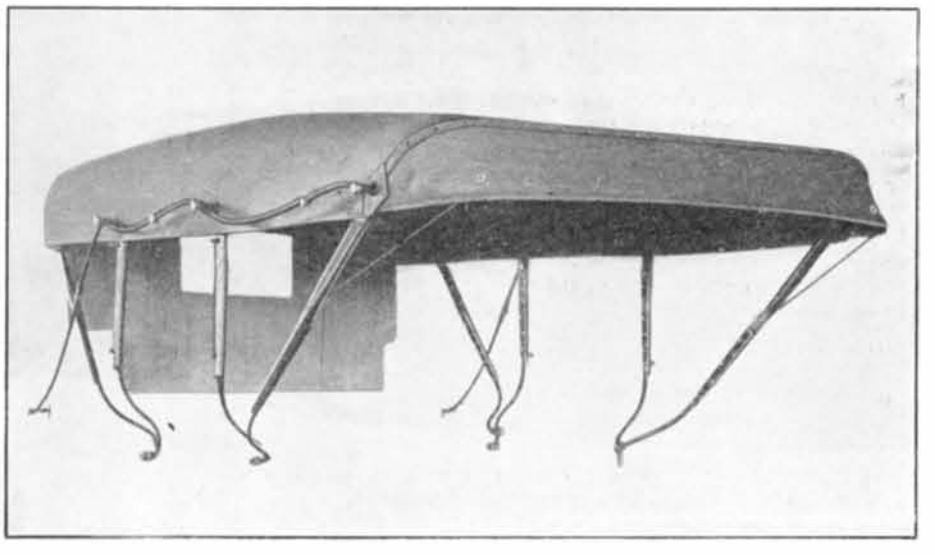
R. E. OLDS, President. **R. M. OWEN, Sales Manager.**

Agencies throughout the United States.

The Sprague Auto Tops

SCIENTIFICALLY MADE

THE SPRAGUE IDEA MADE THE SPRAGUE WAY



OUR NEW TOP

See the curved irons on the bows. This is the only right way to make the bows; **they are straight on the lower ends.** The drop forgings will stay in place, and they make a neat, substantial job. See them at the shows. Ask for Colonel Sprague.

Send for our catalogue.

THE SPRAGUE UMBRELLA COMPANY
NORWALK, O.

The Wright Aeroplane and Its Fabled Performances.

A Parisian automobile paper recently published a letter from the Wright brothers to Capt. Ferber of the French army, in which statements are made that certainly need some public substantiation from the Wright brothers. In the letter in question it is alleged that on September 26 the Wright motor-driven aeroplane covered a distance of 17.961 kilometers in 18 minutes and 9 seconds, and that its further progress was stopped by lack of gasoline. On September 29 a distance of 19.57 kilometers was covered in 19 minutes and 55 seconds, the gasoline supply again having been exhausted. On September 30 the machine traveled 16 kilometers in 17 minutes and 15 seconds; this time a hot bearing prevented further remarkable progress. Then came some eye-opening records. Here they are:

October 3: 24.535 kilometers in 25 minutes and 5 seconds. (Cause of stoppage, not bearing.)

October 4: 33.455 kilometers in 33 minutes and 17 seconds. (Cause of stoppage, hot bearing.)

October 5: 38.956 kilometers in 33 minutes and 3 seconds. (Cause of stoppage, exhaustion of gasoline supply.)

It seems that these alleged experiments were made at Dayton, Ohio, a fairly large town, and that the newspapers of the United States, alert as they are, allowed these sensational performances to escape their notice. When it is considered that Langley never even successfully launched his man-carrying machine, that Langley's experimental model never flew more than a mile, and that Wright's mysterious aeroplane covered a reputed distance of 38 kilometers at the rate of one kilometer a minute, we have the right to exact further information before we place reliance on these French reports. Unfortunately, the Wright brothers are hardly disposed to publish any substantiation or to make public experiments, for reasons best known to themselves. If such sensational and tremendously important experiments are being conducted in a not very remote part of the country, on a subject in which almost everybody feels the most profound interest, is it possible to believe that the enterprising American reporter, who, it is well known, comes down the chimney when the door is locked in his face—even if he has to scale a fifteen-story sky-scraper to do so—would not have ascertained all about them and published them broadcast long ago? Why particularly, as is further alleged, should the Wrights desire to sell their invention to the French government for a "million" francs? Surely their own is the first to which they would be likely to apply.

We certainly want more light on the subject.

AUTOMOBILE SHOCK-ABSORBERS.

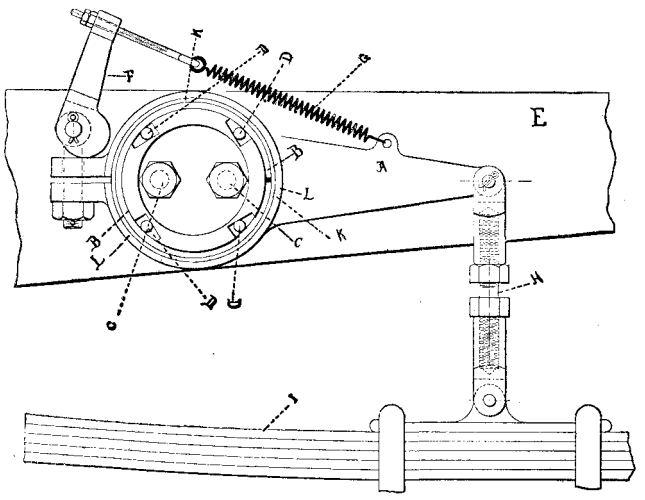
Devices for easing the shock to the springs and checking the rebound of the same are daily becoming more numerous. The original device of this sort was first used on the Richard-Brazier racer, which won the Gordon-Bennett race in 1904. This was the Hartford-Truffault suspension, which has since been widely used on all makes of cars. It consists, in its latest form, of two flat lever arms pivotally attached to the lower part of the spring, where it is clamped to the axle, and to the body respectively. These lever arms terminate in flat disks, which are fastened together by a central bolt, and which clamp a leather washer between them. A five-pronged starwheel on the outside of one disk is used for adjusting the pressure, and is locked in place by a lock nut. The turning motion of the disks on the friction washer, which takes place when the spring is compressed (bringing the two arms together) or when it recoils (throwing the arms apart), produces a braking effect upon the spring, which adds greatly to the easy-riding qualities of the car.

Another form of shock-absorber which has been patented lately consists of a pneumatic pad placed on the axle and having the spring resting upon it. This pad absorbs all the vibrations, and makes it possible to use solid tires on the wheels.

Still another new device for checking the rebound of the spring is shown herewith. The action of this apparatus is as follows:

To the frame of the car is fastened a central disk, by bolts, *C C*. This disk has four cam slots in its periphery, in which are the rollers, *D D D D*. Bearing on these is a steel friction band, *B*, split crosswise to give a certain elasticity as the rollers come and go. Surrounding this band is a fiber band, *K*, which takes the thrust between *B* and the split hub, *L*, of the arm, *A*. The back end of the hub is split and has two extending lugs. Secured in the lower lug is a bolt, which passes freely through the upper lug. Bearing on this lug and pivoted on the bolt is a cam with the upwardly extending arm, *F*, which in turn is connected to the arm, *A*, by the helical spring, *G*. This spring is adjustable in its tension by virtue of the rod passing through *F*. The arm, *A*, is connected by the adjustable rod, *H*, to the spring, *I*, of the car.

When the car goes over a bump, the frame, *E*, moves toward the spring, *I*, and consequently throws up the arm, *A*. This action is without resistance on the part of the device. When the frame and spring tend to separate, however, the four rollers engage with the friction band, *B*, and cause a braking action to take place between the friction band and the fiber band. The tension on the brake is at all times self-adjusting both as to tension and wear, by means of the cam bearing on the upper lug of the split hub and the spring, *G*, the degree of tension being governed by the eyebolt passing through *F*. Thus is obtained a self-

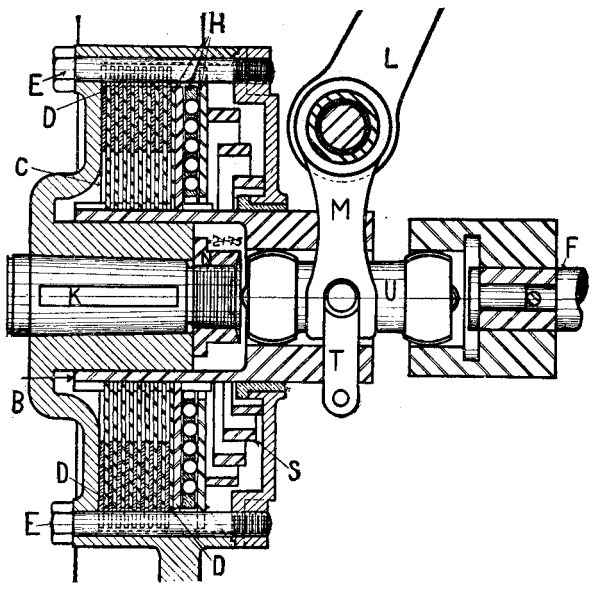


AUTOMOBILE SHOCK-ABSORBER.

adjusting suspension, which only checks the rebound of the spring, allowing it to act without hindrance when deflecting.

THE FRANKLIN AIR-COOLED CARS.

The latest type of Franklin machine is a 6-cylinder, 30-horse-power car, fitted with a 3-speed sliding gear transmission and capable of traveling 50 miles an hour. The engine of this car has mechanically-operated inlet and exhaust valves, as well as auxiliary exhaust valves of the same type. The cylinders are of uniform thickness, and the head has been decreased in thickness over that used last year. The inlet and exhaust valve chambers in the top of the cylinders are flanged with radiating ribs. The auxiliary exhaust valve is said to be beneficial in three ways, viz.: It gives a much freer exhaust, which reduces the back pressure and lowers the temperature of the remaining gases; the main exhaust valve is not subjected to such a severe flame, because the pressure in the cylinder has been lowered; and lastly, no carbon deposits form in the combustion chamber, and the cylinders never become fouled through surplus oil. Graphite may be used in the crankcase, if desired. The diagram showing the cross section of the Franklin clutch gives a good idea of a multiple-disk clutch, such as is now being used on many of the leading cars. The disks are of phosphor-bronze and steel, the former, *C*, being prevented from rotating in the flywheel by the bolts, *E*, on which they are mounted so that they have lateral movement. The other disks, *D*, are located between the first set and are fastened to the clutch sleeve, *B*, on which they can move laterally. This sleeve is connected to the transmission shaft by means of the universal joint, *U*. A flat spiral spring, *S*, holds the plates firmly in contact when the clutch is engaged. As the flywheel revolves, it carries with it the first set of disks, *C*, and these also carry along the second



CROSS-SECTION OF THE FRANKLIN CLUTCH.

set of disks, since all are pressed together by the spring, *S*. When the pedal lever, *L*, is moved forward by means of pressure on the clutch pedal, the clutch-shifter lever, *M*, is moved backward, carrying with it the trunnion, *T*, and the clutch sleeve. The latter brings with it the ball thrust bearing, *H*, consisting of three plates, the center one of which contains a large number of balls. This thrust bearing compresses the spring, *S*, relieving the pressure upon the disks, which are now free to move, and which separate sufficiently for the oil from the oil bath in which the clutch runs to fill the space between them. A certain amount of time is taken for the oil to be squeezed out when the disks are thrust together again by the spring, and the result is that the clutch takes hold gradually and without jerk.

Automobile Notes.

A comprehensive idea of the proportions of the automobile industry in France may be gathered from the fact that in that country there are twenty large motor car manufactories devoted to the production of automobiles, and their average daily output is two vehicles, representing 14,400 vehicles per annum. To these must be added the output of fifty smaller establishments, which produce on the average 9,000 vehicles per year. France has thus an annual total production of over 23,000 motor car chassis, exclusive of carriage bodies and outfits. A large proportion of this production is exported, some 7,000 annually being sent to England, of which a large percentage is re-exported to the colonies. Other countries are also good customers of this prominent French industry.

The proper degree of inflation of the pneumatic tires for automobiles of large size exercises a far-reaching influence upon the life and durability of the tires. A tire insufficiently inflated is short-lived, owing to the rim of the wheel tending to break the beaded edge of the tire from the tread, while excessive inflation maintains the fabric at such a tension that disintegration of the fabric must inevitably occur very quickly. The correct pressure, according to the most prominent manufacturers, should be in the case of the tires for the front wheels from 70 to 80 pounds per square inch and from 80 to 90 pounds for the rear wheel tires. If this pressure is not adhered to a very severe contracting and expanding action takes place just above the point of contact all the time the tire is rolling over the ground, with the result that enormous friction is set up. This causes considerable heating of the walls of the tire with the results of cracking and bursting. To make sure that the pressure is correct, a good pump with a gage should be used, and it is advisable that the latter should be tested from time to time to insure that it is registering correctly.

Accumulator design has recently experienced a radical change by the appearance on the market of the new "Morrison" storage battery, which is manufactured by the Universal Electric Storage Battery Company, of Chicago. The designers of this battery have departed from accepted practice in an attempt to avoid one of the principal causes of depreciation, viz., the shedding or gradual loss of active material from the positive plates. In so doing, they have not only successfully accomplished the results desired, but in addition have gained a noticeable increase in capacity per unit of weight. These departures from the older and better known designs are embodied in a peculiar construction of positive plate. This is made up of twenty or more horizontal rectangular frames, whose length is equal to the width of the plate and whose width is the same as its thickness, i. e., about ½ inch, while their height is somewhat less. These frames have numerous transverse ribs, the spaces between which are filled with active material, thus making each frame a solid rectangular block. These blocks are assembled one above another with transversely-grooved wood separators of the same size placed between them. Vertical side bars dovetailed and lead burned to them tie them together so as to form a complete plate. The result is a plate of unusual mechanical strength in which the active material is totally inclosed, and consequently the possibility of loss from the plate eliminated. By this construction the manufacturers are able to employ a very high percentage of active material per pound of plate. Complete expansion of active material is assured before the sections are filled, and no mechanical pressure is required to hold the active material in place, as is the case with other forms of pasted plate. The active material is consequently left in a very porous condition, allowing good circulation of the electrolyte. As it is within the plate, and surrounded by the lead grid, the elements of the battery can be assembled with the metallic surfaces of positive and negative plates close together, instead of the active material being on the surface, and the lead in the interior. The internal resistance of the cell is accordingly greatly reduced. The manufacturers of the "Morrison" battery claim for their output absolute retention of the active material, giving durability and continued full capacity; large active surface and great porosity of active material for the action of the electrolyte, giving great ampere capacity per pound; better circulation for the electrolyte; two metallic surfaces opposite each other, giving the lowest internal resistance of any cell; great mechanical strength; entire freedom from buckling. The company have in constant service a great number of their batteries used for train lighting, truck, and automobile work, all of which are said to be giving entire satisfaction.

Every man who has cut his automobile eye-teeth, who has mastered his abc's in the school of motor experience, knows that a whole lot depends upon the *maker*, *after* the car is his.

The nimble tongue of the salesman maketh many boasts, and his unblushing assurance giveth the purchaser much hope.

But—what does *the manufacturer guarantee?*—That's the point.

This much is certain: Every maker guarantees *all he safely can*, for, to the experienced buyer, it is the *guarantee* that sells the car, *not* airy, fairy promises.

Now, there are certain reasons—distinguishing reasons—*why* the Stoddard guarantee can be big and broad and generous.

Why the makers *can* and *dare* stand behind their machine—not with a little, limited, conditional guarantee, but with a sweeping assurance of lasting *quality* and *performance* that covers the car like a tarpaulin.

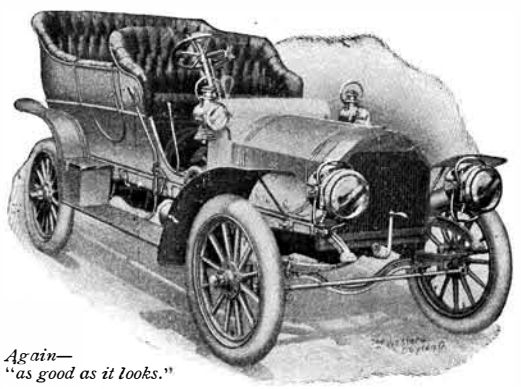
These are the reasons: The frame of the STODDARD-DAYTON Model D Touring Car is made of a kind of steel that is found in no other car—hot-rolled, high-carbon, pressed steel of unequaled toughness.

The weight is equalized and so perfectly distributed that the strain, coming upon *all* parts, really reaches *no* part. The load is cared for by re-enforced springs and roller bearings, swimming in lubrication, so that it just about carries itself.

The motor is of special type, 4½ x 5 inches, 4-cylinder; water cooled; sliding gear transmission; three speeds and reverse. **Selective type,** can change from high to intermediate, or *vice versa*, at speed of 25 miles, without clashing or noise, up hill or down; practically noiseless; entire transmission on roller bearings; mechanical lubrication; 30-35 horse-power. Proportion of power to weight, one horse-power to every sixty pounds. $2,250.

Send for our 1906 catalog K and further particulars as to the guarantee that *proves* our faith and insures *your* protection. Write *to-day*.

THE DAYTON MOTOR CAR CO., DAYTON, OHIO



Again—
"as good as it looks."

Stoddard-Dayton

MODEL D

GROUT

Price, $2500, including Top, Headlights, two Oil Lights, Horn in rear and a full set of tools

SEE OUR EXHIBIT AT THE AUTOMOBILE CLUB SHOW
69TH REGIMENT NEW ARMORY, 26TH ST.
NEAR 4TH AVE., NEW YORK

GROUT CARS ARE SIMPLE IN OPERATION, AND STRONG AND DURABLE IN CONSTRUCTION

Grout Bros. Gasoline Car

30-35 Horsepower, 4-cylinder balanced motor, high-tension ignition, using one coil with distributing commutator. Great attention has been given to our oil and electrical systems

Grout Bros. Automobile Co., Orange, Mass.

NEW YORK OFFICE AND SALESROOM, MUNSING & CHAPMAN, 1855 BROADWAY

Columbia

GASOLINE CARS FOR 1906

ARE built of the best materials in the world under methods and processes more advanced than those employed in any automobile factory other than our own. No consideration of the cost of production has been permitted to interfere with making perfect every part and piece of each model, whether pertaining to mechanism, bodywork or general equipment. The expense of making the crankshafts, for instance, is six times greater than that of any previously made in this country. We guarantee that these cars, each according to its power and place, will yield the greatest things possible in motor service.

Mark XLVII 40-45 h. p. four-cylinder motor under forward bonnet; sliding gear transmission, four speeds, and one reverse; jump spark ignition from storage battery; new pattern automatic carburetor; spacial chrome-nickel steel gears, axles, crankshaft and jackshaft; crankshaft machined cold out of solid block; double chain drive; I-beam front axle forged in one piece; pressed steel frame; 108-inch wheel base; seat starting; new pattern brakes. Price, with standard body $4,500
With 112-inch wheel base, Royal Victoria, Double Victoria, Limousine or Landaulet body, $5,000 to $5,500

Mark XLVI An entirely new model, 24-28 h. p. four-cylinder, vertical water-cooled motor; shaft-drive; sliding gear transmission, three speeds and reverse; low tension make and break magneto current ignition; special chrome-nickel steel gears and shafts, crankshaft machined cold out of solid block; I-beam front axle forged in one piece; rotary pump oil lubrication; pressed steel frame, 98-inch wheel base; double side entrance body seating five passengers. Price $3,000

Mark XLIV-2 Perpetuating Mark XLIV, one of the most successful of medium-weight 1905 cars. 18 h. p. double opposed horizontal motor under forward bonnet; frame length increased eight inches, giving ample room forward of each seat; wheel base increased to 90 inches. Rear seat widened five inches; double side entrance body. An ideal family car, which will climb any hill and maintain a speed of 35 miles per hour on the level. Price $1,750

Columbia Electric Carriages

Victoria-Phaetons, Runabouts, Broughams, Landaulets
Hansoms, Surreys, Delivery Wagons, Trucks

Separate catalogues of Columbia Gasoline Cars, Columbia Electric Carriages and Columbia Electric Commercial Vehicles will be sent on request

At New York we shall exhibit at Madison Square Garden only, January 13-20

ELECTRIC VEHICLE CO., HARTFORD, CONN.

New York Branch: 134-136-138 West 39th St.—Chicago Branch: 1332-1334 Michigan Ave.—Boston: Columbia Motor Vehicle Co., 74-76-78 Stanhope St. Philadelphia: Pennsylvania Electric Vehicle Co., 250 North Broad St.—Washington: Washington E. V. Transportation Co., 15th St. and Ohio Ave.—Paris: A. Bianchi, 194 Boulevard Malesherbes.

Member Association of Licensed Auto Mfrs.

A New Pneumatic Tire

MADE BY

FIRESTONE

THE RUBBER TIRE SPECIALISTS

After exhaustive experiment and careful study of the requirements of pneumatic tires, we have invented a tire which has every possible good feature of the best, with practically all of their objectionable features eliminated.

FIRESTONE PNEUMATIC tires have withstood the most exacting tests during the past two years, and we can assert positively that we have more nearly reached the point of absolute perfection, than has yet been attained by pneumatic tire makers.

FIRESTONE TIRES are sightly on the wheels. Good, practical common sense, and accurate knowledge of the rigorous requirements of a good tire, are apparent to the most casual observer. The fastening device is positive, and will securely hold the tire under all conditions, and, whether inflated or deflated, there is no possibility of creeping or rim cutting. The most inexperienced person can easily remove the tire in two minutes and replace it in the same time, and he ***cannot pinch the inner tube*** because in the FIRESTONE construction it simply ***cannot be pinched.***

For many years the name FIRESTONE has stood for the highest grade of excellence in solid tires. We know the tire business in every detail. We know we have a pneumatic tire which is without a peer, a tire which will receive and merit an extensive demand. To enable us to meet any demand which may be made, we have erected immense new buildings and equipped them solely for the manufacture of pneumatic tires.

OUR FACILITIES ARE ENORMOUS. OUR TIRES ARE RIGHT. Our successful business career has demonstrated our ability to accomplish what we undertake.

We want you to know more about FIRESTONE TIRES. Study them. Examine them as closely as you please, and we know you will be a FIRESTONE customer.

Write for Illustrated Booklet.

FIRESTONE · TIRE & RUBBER CO.
AKRON, OHIO

BRANCHES:
New York Boston Philadelphia Chicago Detroit St. Louis

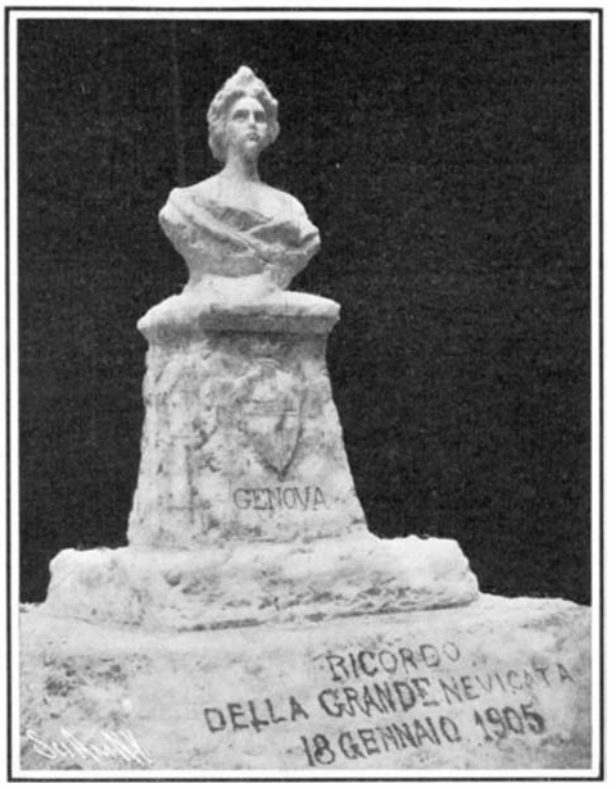
SNOW SCULPTURES.

BY DR. ALFRED GRADENWITZ.

There is some ground for the statement that snow is the most widely used material for modeling, though the latter, it is true, is generally of a very primitive description. In practically every country where the snowfall is sufficiently heavy, the boys of the cities; as well as their brothers of the country districts, at the arrival of winter proceed to form the glittering white masses into coarse shapes, which an active fancy will recognize as the representations of men or animals. In some localities this sport is developed to a fairly high degree, and entire communities, young people and old, often take a hand in the healthful pastime. In the Harz Mountains of Germany, for instance, attractive groups of snow sculptures are sometimes encountered, though these productions never attain the level of true art.

An Italian sculptor, Signor Achille Carressa, of Genoa, who has become famous through his Columbus monuments designed for certain South American cities, was one of the first to accomplish the task of producing snow representations of truly artistic value. The southern home of the artist bids fair to surpass parts even of the north of Europe in the rigidity of its climate, and with the first heavy snowfall Signor Carressa quickly installs his studio on the neighboring Piazza San Giro, and surrounded by the wondering crowd, he produces these charming examples of the plastic art, which by their delicacy of design and execution are little inferior to marble sculptures.

The accompanying engravings illustrate several of these works of the Italian artist. The latest production is the statue of Genova, patroness of the city of Genoa. The inscription reads: "Record of the Great Snowfall of January 18, 1905," and a splendid, though fragile souvenir the statue is. It is truly unfortunate that the only means for preserving these works of art is through the agency of the camera.



Genova, the Patroness of Genoa, Made After the Snowfall of January 18, 1905.

The Money of Savages.

BY HENRI COUPIN.

Many savage tribes know no commerce except the direct exchange of one useful object for another, but numerous other tribes have experienced the necessity of facilitating business by the creation of a standard currency which enables exchanges to be made indirectly and at any time. This money varies greatly in character in different places. Sometimes it has only an arbitrary value, sometimes it is also available for use as ornaments, or otherwise.

The money most commonly employed by primitive peoples consists of useful objects. Examples are: Slaves (in Africa and New Guinea), cattle (reindeer among the Lapps), salt (in Laos), furs (in Siberia), cloth (in Africa), shells, beads, feather and other ornaments, and even various articles of food.

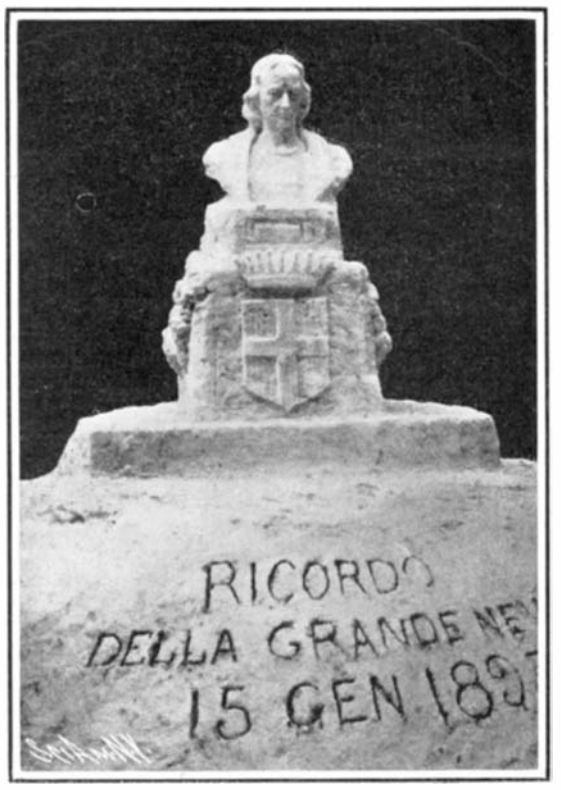
If the money is not useful in itself it must naturally be composed of rare materials. "Thus the Pellew islanders," says M. Deniker, "carefully preserve as current money (andou) a certain number of obsidian or porcelain beads and prisms of terra cotta, imported no one knows when or how, which have very high values. One tribe possesses a single prism of clay (called baran) which is regarded as a public treasure. In the neighboring island of Yap the place of money is taken by blocks of aragonite, a mineral which is not found in the island but is brought from the Pellews. The value of a block is proportional to its size, a thousand-franc note ($200) being represented by a huge disk which two men can hardly carry. These stones serve rather to flatter the vanity of the wealthy natives, who exhibit them in front of their huts, than to facilitate barter."

But this is an exceptional case. Usually, preference is shown for more convenient objects which combine a maximum of value with a minimum of weight. For example, the Chorchon and Bannock Indians of Idaho and Montana use teeth of the wapiti deer as money. For the same reasons Scandinavian tribes, like the ancient Carthaginians, employ as money the skins, and the Michmis make use of the skulls, of animals, while the money of the Loyalty Islands consists of ropes made of fox hair, which may be cut to any desired length. The Mexicans formerly made extensive use of cacao beans and this sort of money is not yet entirely obsolete, despite modern facilities of communication.

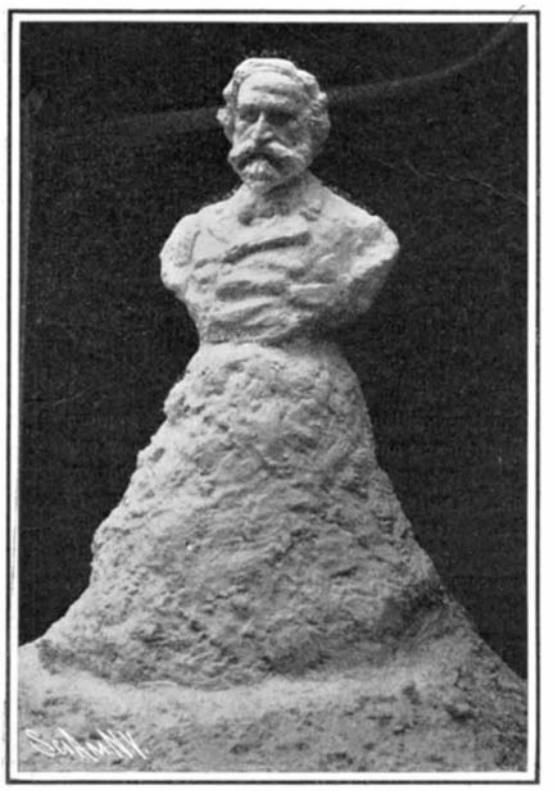
Shells are often used as money. According to M. Deniker, the tooth shell, or "elephant's tusk," is thus employed by the Indians of northwestern America. The wampum beads of the tribes of the eastern United States are made of the shells of *Venus mercenaria*, a species akin to the cockles, etc.

But of all shells the cowry is most used as money. The species most frequently employed are *Cyprea moneta* and *Cyprea annulus*, of which the former appears to be commonest in Asia, the latter in Africa.

Both species occur throughout the Indian Ocean, but they are gathered in large quantities in only two districts, the Maldive islands, west of Ceylon, and the Sulu archipelago, between Borneo and the Philippines.



A Characteristic Bust of Columbus by Signor Carressa.



A Striking Likeness of the Italian Composer Verdi.

SNOW SCULPTURES.

On the Asiatic continent they are used as money most extensively in Siam and Laos, where, twenty years ago, from twenty to thirty cowries were equivalent to one centime (100 to 150 to a cent).

Tropical Africa, however, is the true realm of the cowry—a fact which is explained by its rarity. The shell is not found in the Atlantic and it has traversed the continent from Zanzibar, on the east, to Senegal, on the west coast, solely in consequence of commercial relations. Such relations must have been established at a very early date, for Cadamosto and other Portuguese explorers of the fifteenth century speak of the use of cowries as money among the "Mames" of Senegal. In Africa the exchange value of the cowry is much higher than in Asia, a fact which indicates that it is imported. The cowry was probably introduced to the east coast of Africa by the Arabs. Subsequently the importation was carried on also by Europeans. The cowry is still current money throughout the west coast of Africa as far as the River Conanza in Angola. Farther south, in the region extending to Walrus Bay, we find another variety of "shell money," consisting of fragments of a large land shell, *Achatina monetaria*, strung in cords. This money is manufactured chiefly in the Selles district in the interior of Benguela, whence it finds its way throughout the coast and even to London. The strings of shells are about 20 inches long and were worth, fifteen years ago, from 10 to 30 cents each.

Among articles of food employed as money the most important are rice in the Philippines, bricks of tea in Mongolia, and lumps of salt in central Africa, where this indispensable substance is very rare.

Iron, bronze, and other metals are very widely used as money. They occur in many forms, from simple rods and crosses to the circular coins common among civilized peoples. Sometimes the form is such that any desired value may be obtained readily by cutting. In central Africa, for example, debts are paid in brass or copper wire, and bars of silver are current money in China.—Translated for the Scientific American from La Science au XXme Siècle.

The Blessings of Cold.

In the Medical Era for October, Dr. Robert Peter maintains that cold is a blessing when you learn to endure it. He points out that its endurance can be acquired gradually if begun early in the season. He does not believe in coddling the body with woolens. "Better keep blood in circulation by outdoor exercise," says he, "so that if heavier clothing should really be needed the body will not require its encumbrance too much."

Graduated baths, with friction, he tells us, will harden the body very much, especially when followed by vigorous exercises in graded temperatures. "I know a man," says he, "who is always astir and who wears not even a shirt, but only blue jeans and blouse, all the year round. He has his windows open all the year round, day and night, no fire, and thoroughly enjoys it. While this is an extreme case, it shows how one can inure himself to cold."

Dr. Peter expresses the conviction that the subjects of ventilation and heating, which are important factors in the winter months, are not as well understood as they might be, and he attributes much of the illness during the inclement part of the year to the foul air and fuel gases, to which the baneful effects of indoor life are mainly due. According to him conditions should be reversed, and it would be wiser to camp out and bask in the winter sun and to stay at home in the summer shade.

"As to ventilation," says he, "it can never be overdone, and especially is this true at night. Our bedrooms should be well ventilated. One-third of our lives is spent in them. A bedroom with southern exposure is probably best in winter and it is a cheer and godsend. It is death to germ life. It will cut short a cold or catarrh and the white plague cannot lurk there. As we need the shade in summer, we need the sun in winter."

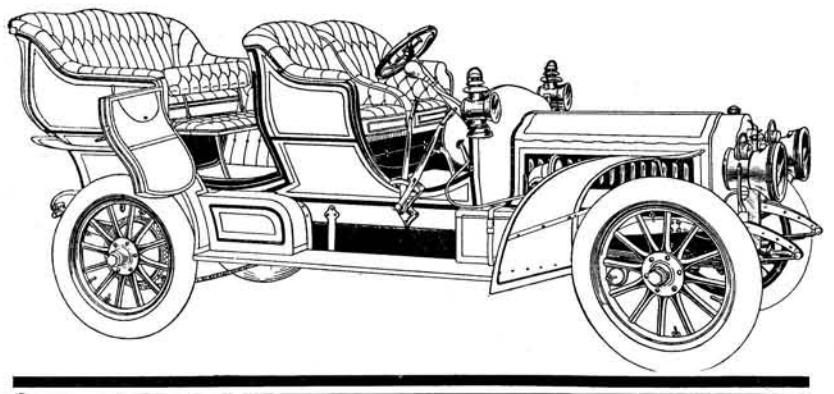
After a consideration of the diet, which should be more stimulating at this season of the year, the author emphasizes the fact that the respiratory organs mostly stand the brunt of the winter diseases. The doctor believes that we must look to the circulation to help us out in our prophylaxis. "After a cold is once contracted, however," he says, "open the flood gates of elimination and equalize the circulation. A good physic or a Turkish bath may restore conditions."

In recent years the construction of railways proceeded in Germany at the rate of about 621.5 miles per annum. The entire mileage exceeds at present 34,183 miles. The electrification of railways is still confined to a few suburban lines, where the system works satisfactorily. The question of long-distance electric railways is still being studied, but no decision has been arrived at so far. Plans are said to be under consideration for the introduction of electric services between Düsseldorf and Cologne—23 miles—and Berlin-Hamburg—185 miles.

AN AMERICAN CAR AT LAST
THAT WELCOMES WORLD COMPARISON

Fifty-Horsepower **Thomas Flyer**

Every stock Thomas car guaranteed to show sixty miles an hour before leaving the factory



TO quote the words of E. R. Thomas: "The 1906 Thomas is especially constructed to maintain its absolute American leadership and to wrest supremacy from foreign cars." In other words the Thomas becomes this year a factor of international importance, challenging and inviting comparison, point for point, with the greatest and best cars the world has yet produced. The mere fact that every (stock) Thomas is guaranteed to show 60 miles an hour before shipment is neither the least nor the greatest of its claims upon your consideration. It is easily capable of 65 miles an hour carrying five people, and it will climb a 14 per cent grade carrying the same number at the rate of 40 miles an hour; but its pre-eminence does not begin nor end there.

These are the concrete results which every Thomas owner may demonstrate—and these results spring from a magnificent superiority of material, and especially of construction, which marks a new epoch in American Automobile manufacture.

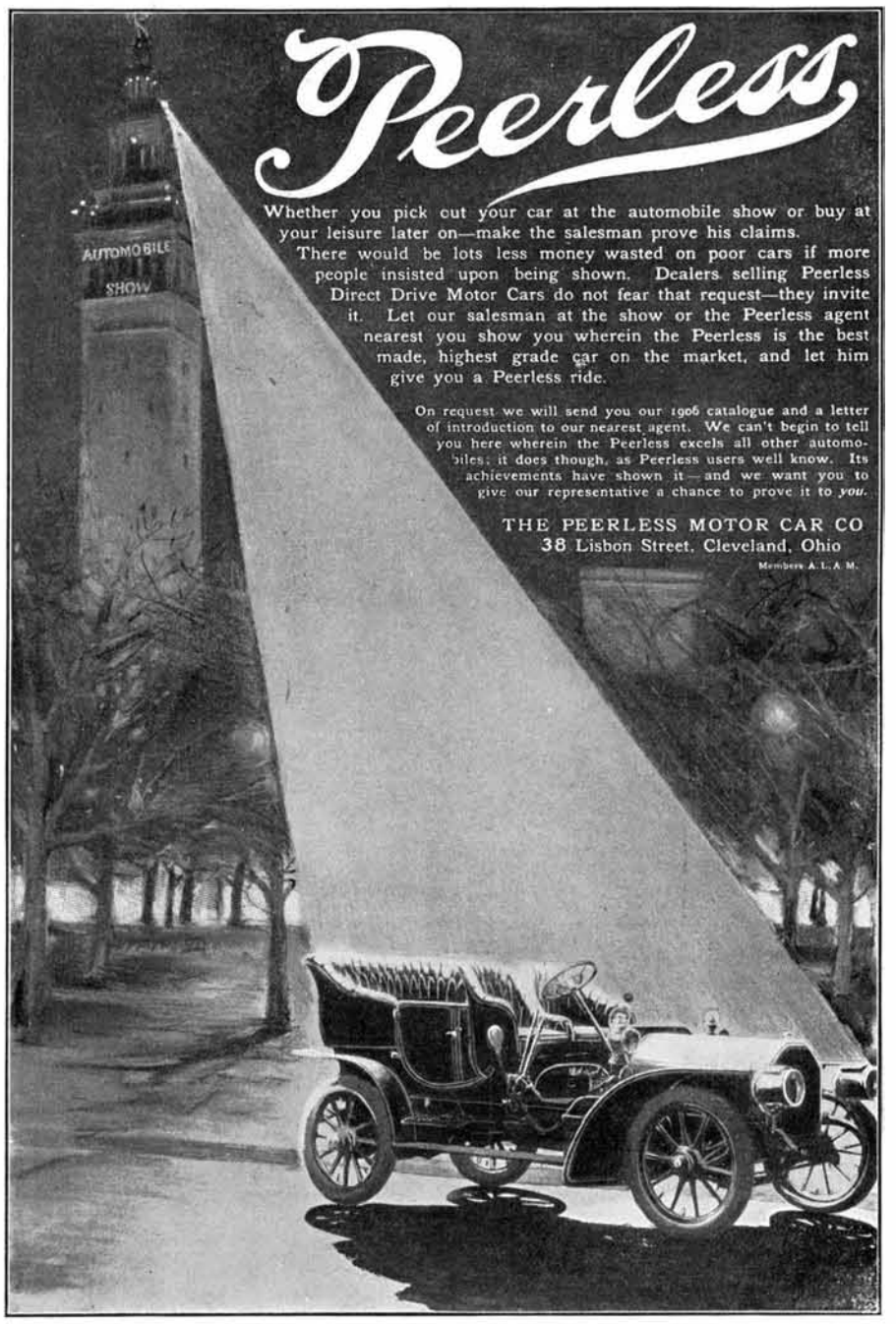
It behooves you, if you are interested in a car which sweeps away the last vestige of prejudice in favor of foreign automobiles, to get in touch at once with your nearest Thomas Representative. Meanwhile write to us for the beautiful new Thomas catalogue.

THE THOMAS MOTOR COMPANY
2000 NIAGARA STREET BUFFALO, N. Y.

MEMBERS ASSOCIATION LICENSED AUTOMOBILE MANUFACTURERS

WE EXHIBIT IN N. Y. AT MADISON SQUARE GARDEN ONLY

Peerless



Whether you pick out your car at the automobile show or buy at your leisure later on—make the salesman prove his claims.

There would be lots less money wasted on poor cars if more people insisted upon being shown. Dealers selling Peerless Direct Drive Motor Cars do not fear that request—they invite it. Let our salesman at the show or the Peerless agent nearest you show you wherein the Peerless is the best made, highest grade car on the market, and let him give you a Peerless ride.

On request we will send you our 1906 catalogue and a letter of introduction to our nearest agent. We can't begin to tell you here wherein the Peerless excels all other automobiles; it does though, as Peerless users well know. Its achievements have shown it—and we want you to give our representative a chance to prove it to *you*.

THE PEERLESS MOTOR CAR CO
38 Lisbon Street, Cleveland, Ohio
Members A. L. A. M.

WELCH

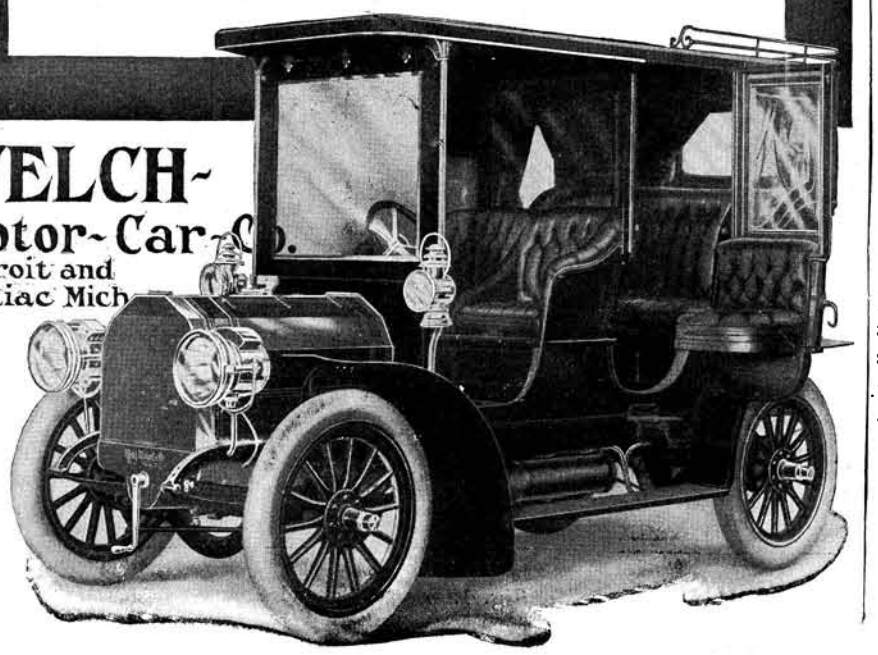
50 Actual Horse Power

A combination of imported steels and "hand" workmanship with American simplicity of design and interchangeability, makes of the 1906 Welch, a car equalled by none.

Buy car whose vital points have been in use practically unchanged for several years, and that is being copied much more extensively by prominent makers than any other car in existence.

Buy a one that is guaranteed to give better service the second season than the first, and that will not be a back number in six months through the caprice of the maker, a car that will carry you on the *direct* drive from four to fifty miles, or better, per hour, and take ninety-five per cent of all hills on the high gear. *Know* what you are buying. Ask for our treatise on Horse Power and our latest catalog.

Welch Motor Car Co., Pontiac, Mich.



WELCH-
Motor-Car-Co.
Detroit and
Pontiac Mich.

POPE-HARTFORD MODEL F

is the result of our 28 years of experience in making and marketing mechanical vehicles and is the latest product of our famous Hartford factories. MOTOR: consists of 4-cylinder, vertical, water-cooled engine with cylinders cast in pairs; all gears encased; brake test 28-30 H. P. TRANSMISSION: sliding gear, 3 speeds forward and reverse. CARBURETOR: specially designed, insuring economy in fuel consumption and maximum power. CONTROL: throttle and ignition levers on single sector that does not revolve with wheel. DRIVE: bevel gear through propeller shaft to the rear axle. TONNEAU: non-removable, dust-proof, double side entrance. DESIGN: artistic in conception and execution.

While great attention has been given the essentials of construction it will be found that no detail has been overlooked. Everything that will contribute to the user's comfort and convenience has been embodied in this up-to-date car. (Extension top, $125 extra.) **Price, $2,500**

Pope-Hartford Model G

is our 2-cylinder, opposed, 18 H. P., touring car. The engine is under the hood and all parts are accessible for inspection and repair. This is our dependable 2-cylinder machine of last year with such minor changes as have been suggested by a season's use. **Price, $1,600**

POPE MANUFACTURING CO.
Hartford, Conn.

New York City: 1733 Broadway
San Francisco: 451 Mission St.
Boston: 223 Columbus Ave.
Washington: 819 14th St. N. W.
A. L. A. M.

POPE Hartford AUTOMOBILES — POPE Tribune AUTOMOBILES

ELECTRICITY IN HOSPITALS.

BY EMILE GUARINI.

Among the manifold purposes for which electricity is capable of being employed, its applications to therapeutics are the most curious, and a number of them are doubtless known to our readers. However this may be, we think it will prove none the less interesting to describe the electric apparatus which hospitals now have at their disposal.

The description that we propose to give is that of the apparatus which has been furnished quite recently to a hospital of London by Messrs. Lemmon & Co., of that city.

Among the principal of such apparatus we may mention those employed for the treatment of neurasthenia, rheumatism, anæmia, and pulmonary tuberculosis; a Lortet-Genoud lamp, a Finsen-Reyn lamp, an improved Finsen apparatus, a Roentgen apparatus, a Wimshurst machine, etc. The various instruments are placed in the upper-story rooms of one of the buildings. They are supplied by two groups of generators of electricity, that is to say, by two groups each consisting of a steam motor that actuates an electric generator.

These generators give a continuous current and send it to a distributing board provided with commutators, etc., in order to permit of distributing the current among the different experimental rooms.

For the treatment of arthritis, rheumatism, anæmia, and neurasthenia use has been successfully made of high-tension currents, which are also efficaciously employed for pulmonary tuberculosis in certain stages. These currents are produced by means of an induction coil, with a special mercury interrupter. This latter is actuated by a small motor that receives a continuous current from the line wire.

A continuous current is likewise sent through the intermedium of the interrupter to the primary of the coil, which thus receives very short emissions that succeed one another very rapidly, and, through induction, produce alternating currents in the secondary of the coil. The rapidity of the oscillations is increased by connecting, as in wireless telegraphy, the electrodes between which the sparks jump with the armatures of a battery of Leyden jars. The tension thus obtained is enormous and the discharges are very strong. Nevertheless they are applied to the subject to be treated, without any danger, either in the form of general or partial electrification.

The French Lortet-Genoud lamp, which the hospital has more or less modified, is applied to the treatment of lupus, that repugnant disease of which electricity has cured so many persons, and also to the treatment of rodent ulcer. We have all probably had an opportunity of witnessing some of the ravages of these two cutaneous affections. Diseases of this kind, those of the skin, are extremely painful, and those afflicted with them sometimes present a horrible sight. In this domain alone electricity has already earned our gratitude, since, for such affections, it furnishes one of the best remedies hitherto discovered.

The Lortet-Genoud apparatus (Fig. 1) consists of an arc lamp mounted upon a heavy standard, and the rays of which are projected by means of a double screen provided with two central lenses of rock crystal upon the affected part of the patient.

Between the walls of the lens support circulates the cold water designed, as in the types to be mentioned further along, to protect the lenses and absorb the calorific rays. The pencil produced by the lamp consists, in fact, of calorific, luminous, and chemical rays, and the object to be attained is to disperse those that would have only an injurious effect, and allow of the passage of the chemical ones, which alone are capable of acting efficaciously.

The Finsen apparatus, of which the Finsen-Reyn is only a simplified modification, is likewise employed for the treatment of lupus. It is therefore designed to permit of concentrating a pencil of chemical rays, that is to say, of ultra violet ones, upon the affected part of the patient, who lies upon a special couch.

In the simultaneous treatment of several persons, there is employed an improved model which is especially characterized by a better utilization of the luminous intensity of the lamp, the consumption of which is notably reduced as compared with that of the former types. It consists (Fig. 2) in principle, of a

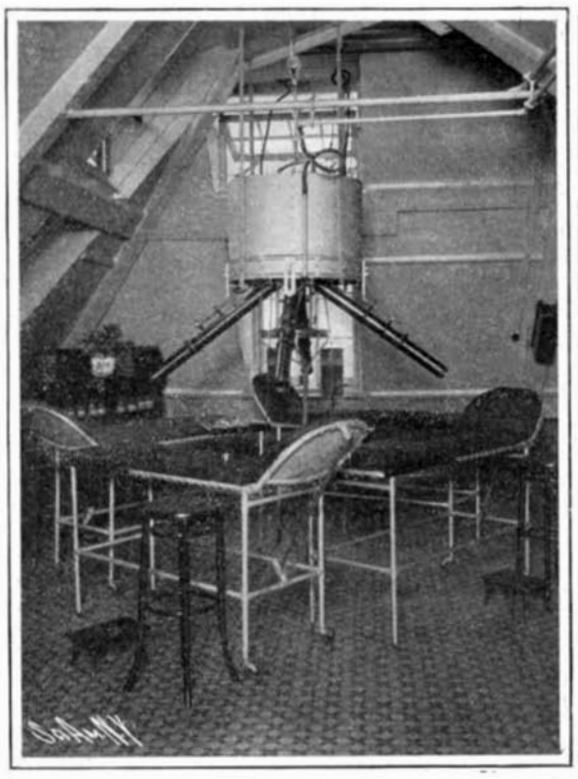


Fig. 2.—Finsen Apparatus.

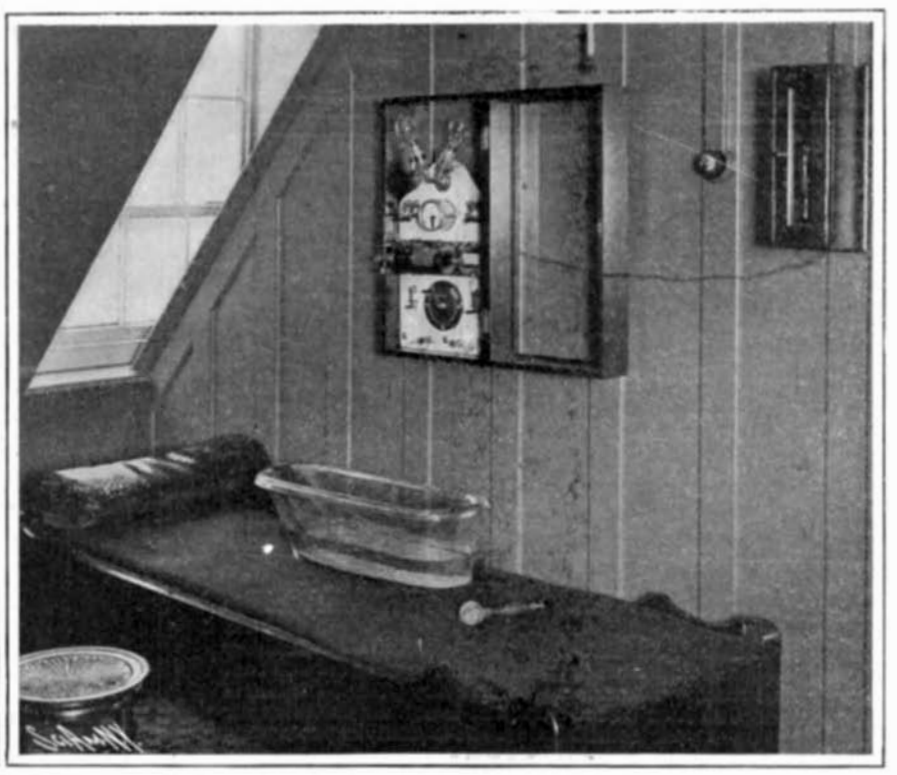


Fig. 3.—Apparatus for Galvanic, Faradic, and Electrolytic Treatment.

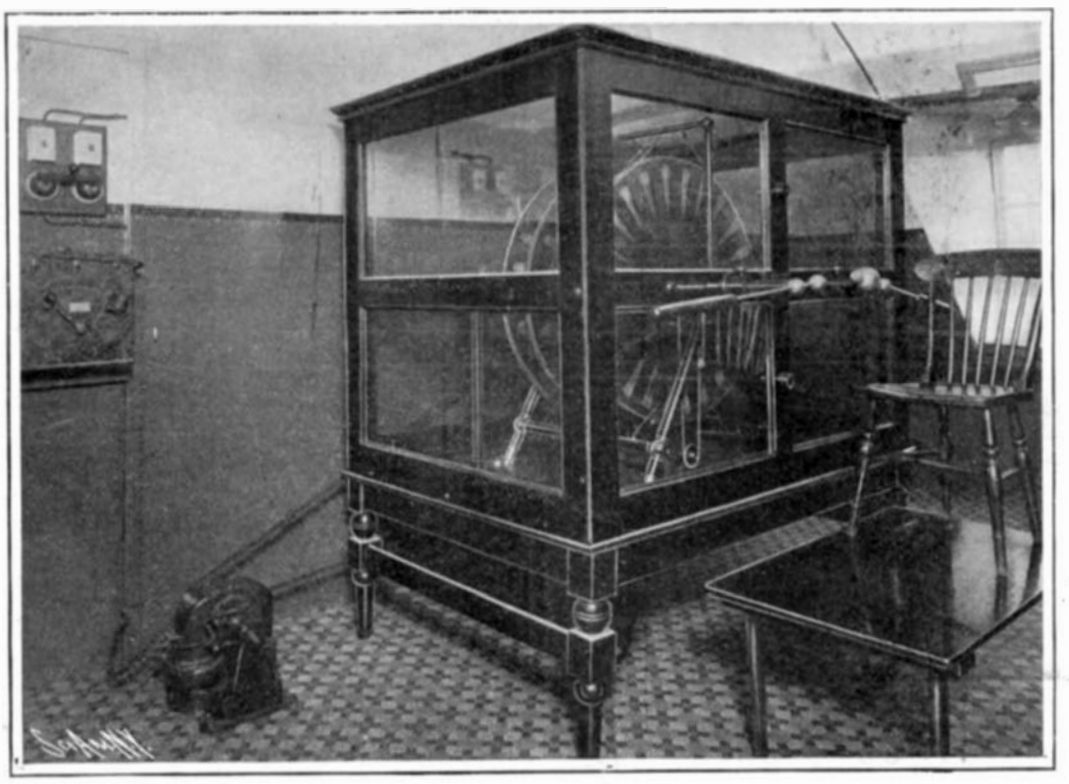


Fig. 5.—A Wimshurst Machine.

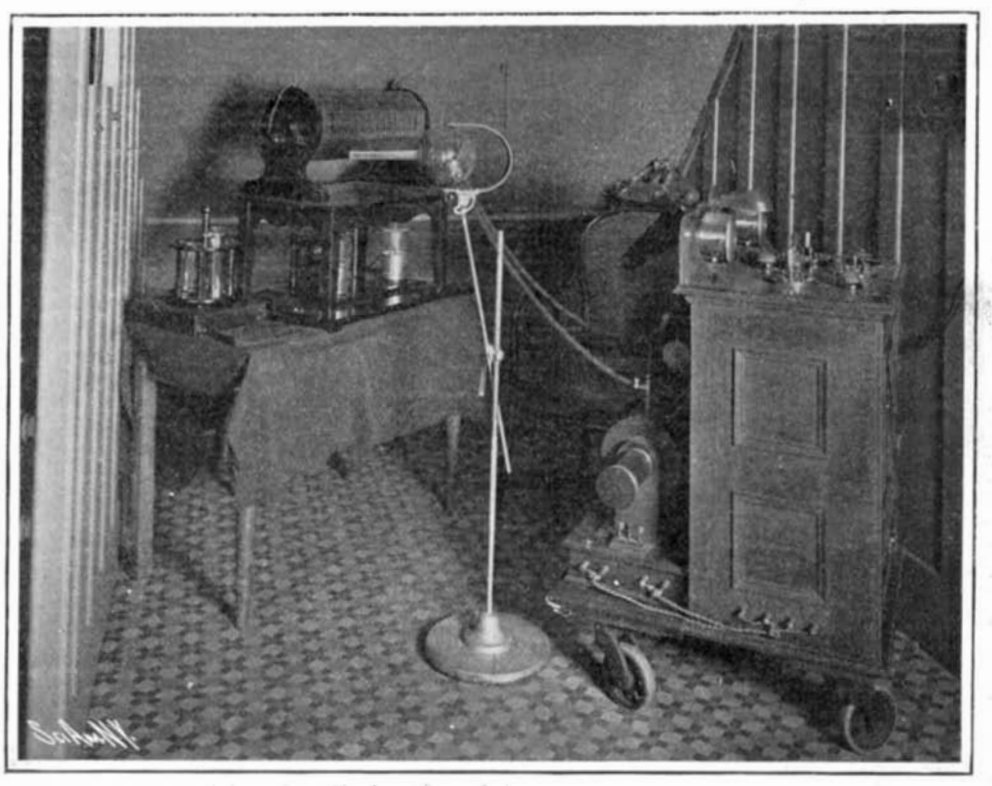


Fig. 4.—Roentgen Apparatus for Hospital Use.

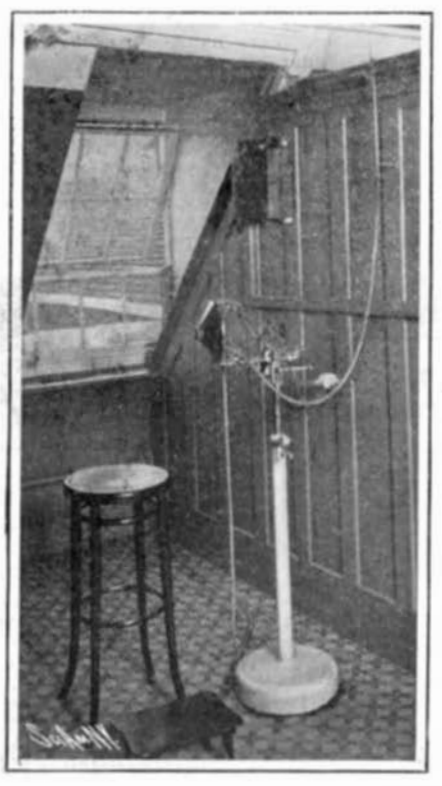


Fig. 1.—Lortet-Genoud Lamp.

At the Madison Square Garden Automobile Show the

OLDSMOBILE

will center public interest in the Palace Touring Car and the Two-Cycle. Both of these cars emphasize the wonderful development of automobile construction in America. In style they set a swift pace for European manufacturers, and in performance they leave nothing to be desired in the way of speed, reserve power, easy riding qualities and general all-round completeness. Careful attention to the minutest detail is apparent in every line from the perfected motor to the adjustable lamp brackets.

If you, as a Possible Buyer of an Automobile (the Probable Buyer of an Oldsmobile after you have investigated) are too busy just at this time to let us give you a demonstration of our 1906 models, you can make a note, mental or otherwise, of the points which mark the strong individuality of these cars —the superior quality and big value they represent on your money investment.

In general appearance the Palace Touring Car, Model S and The Two-Cycle, Model L are very similar, both conforming in design to the most approved European practice. The general lines of both cars are the same. Both have all the regulation outfit, sliding gear transmission, pressed steel frame, bevel gear drive, material of the best—everything that anyone has or wants to have and a number of features all our own.

The gasoline "motor"—the *life center* of the automobile—is merely a gasoline engine. We have built gasoline engines for 25 years, and we know this end of the business—know what *not* to build as well as what to build. The result of this experience is found in the motor equipment of every Oldsmobile.

The Four-Cylinder Motor of Model S is compact and free from complications; it is vertical, water-cooled, located under hood, and perfectly balanced. The bore is 4¼-inch with 4¾-inch stroke, and the actual horse power is from 26 to 28. The weight of the car is 2,200 pounds. Wheel base 106 inches. Price $2,250, with complete horn and lamp equipment.

The Two-Cycle Motor is likewise vertical, water-cooled and located under hood. Bore 5 inches, stroke 5 inches. THERE ARE ONLY THREE WORKING PARTS IN THE MOTOR ITSELF. If you don't know anything about gears, valves, guides and a few other things, you don't have to learn, because they are not there in The Two-Cycle. It is a 24 H. P. team without a harness. It's the only new thing in the last five years—a trial will convince you. Price $1,250, with complete horn and lamp equipment.

We have a number of other good cars in our line—cars that have proved their staying qualities and worth through years of service. Complete information regarding any of our models can be obtained by making use of the coupon below.

OLDS MOTOR WORKS, Lansing, Mich., U. S. A.

Member Association of Licensed Automobile Manufacturers

CUT COUPON HERE

CATALOG COUPON

OLDS MOTOR WORKS
LANSING, MICH.

Kindly send me information regarding cars checked. I am interested.

MODEL B.... DELIVERY CARS....
MODEL S.... PASSENGER TRAFFIC
SA MODEL L.... CARS....

Name .....
Address .....
.....

CUT COUPON HERE

CUT COUPON HERE

CALENDAR COUPON

OLDS MOTOR WORKS
LANSING, MICH.

Enclosed find 10 cents, for which send your large Art Calendar (free from advertising and suitable for framing) for 1906. Design by George Gibbs.

SA

Name .....
Address .....
.....

CUT COUPON HERE

CUT COUPON HERE

MOTOR TALK COUPON

OLDS MOTOR WORKS
LANSING, MICH.

Enclosed find 25 cents, for which have MOTOR TALK, *a magazine devoted to automobiling, sent to me for 1 year.*

SA

Name .....
Address .....
.....

metallic cylinder suspended from a strong support and inclosing a lamp of great illuminating power. To this cylinder are secured telescopes, as well as tubes for the circulation of water for cooling the telescopes and compressors. These telescopes are provided with rock crystal lenses. Between the two side ones there is a space filled with distilled water for the purpose of protecting the lenses against a high temperature and of eliminating the calorific rays. The last of these are absorbed at the other end by a column of distilled water about twelve inches in length comprised between the two lenses. The compressors consist of two rock crystal lenses between which water constantly circulates. They are applied closely to the skin and finally exclude every trace of all but the chemical rays.

Another operating room contains apparatus (Fig. 3) for experiments in galvanism, Faradization, and electrolysis. Here, too, are treated rheumatism and paralysis, and more particularly the affection known as writer's cramp.

The apparatus of this laboratory are connected with a tablet of polished marble which carries different measuring, regulating, and commutating instruments. These latter are principally a sensitive galvanometer of precision for measuring intensities; a reversing commutator for reversing the direction of the current; and a rheostat, otherwise called a regulatable resistance, of 10,000 ohms divided into 56 degrees, that is to say, permitting of passing from 0 to 10,000 ohms through 56 graduated values, and of thus obtaining a very precise regulation of the current, etc.

A second group of very similar apparatus is placed in another room.

Roentgen rays are rendering valuable services in therapeutics, and the use of them in hospitals is now quite general. These rays, with whose strange powers every one is familiar, are, as is well known, obtained by producing electric discharges of great frequency in bulbs of highly rarefied air. Such discharges are produced by an induction coil of which the arrangement presents certain analogies with that which we have briefly referred to above in connection with high-tension currents. The most characteristic part (Fig. 4) is the bulb, which is mounted upon a heavy standard surrounded by a transparent screen in the form of a globe, which intercepts the X-rays and protects the operator and patient against their dangerous effects. They are capable of reaching only the part of the body affected, since they are conducted by a tube of appropriate form fixed in an aperture with which the globe is provided. Such an arrangement presents different advantages.

Let us have a few words to say also of the Wimshurst machine (Fig. 5), one of the most remarkable of friction apparatus, and which is described in all works on electrostatics. This apparatus is employed with success in America for the treatment, under the name of Franklinization, of certain nervous affections, and especially of rheumatism. The use of it is spreading likewise in England.

Finally, an apparatus which is no less interesting is the one that serves for massage and advantageously replaces massage by hand. This apparatus, of which the use is rapidly spreading, consists of an electric motor to the shaft of which is secured a large flexible cable, to the end of which is fastened a ball to which is communicated a vibratory motion of which the amplitude depends upon the regulation given it by means of a special arrangement that can be made to act during the operation. In this massage ball there are three screw holes into which may be introduced pieces of appropriate form for the local massage of small muscles in certain parts of the body. The motor employed for this is a special one, and is at the same time a transformer which converts the continuous current furnished it by the line wire into an alternating one—a form of current that changes direction periodically and regularly with more or less rapidity.

Another purpose for which the current is used is for the small electric lamps employed for the treatment of laryngitis and analogous affections. The applications of electric energy to medicine will doubtless not stop here. Surgery will also find in the electric current a sure and valuable aid.

M. Leduc has already made known the anæsthetic effect of electric currents of high frequency, and has demonstrated that, under their influence, any animal falling upon the side sleeps a deep sleep that is interrupted neither by the prick of a needle or a burn by a hot iron.

It is doubtless known that MM. Didsbury and Regnier have constructed upon this principle an apparatus designed for the painless extraction of teeth. It has recently been found that the violet rays have the same effect.

The rays of an incandescent lamp, with a bulb of proper color surrounded by an appropriate shade, directed upon the eyes of a patient by means of a reflector of nickel-plated metal, produce at the end of two or three minutes an anæsthesia that suffices for the performance of unimportant operations.

These are facts of great interest that are multiplying every day and are constantly increasing the number of our methods of combating disease.

A BICYCLE GENERATING STATION USED BY THE GERMAN ARMY'S WIRELESS TELEGRAPH CORPS IN THE SOUTH AFRICAN CAMPAIGN.

A NEW TYPE OF PORTABLE WIRELESS TELEGRAPH STATION.

BY DR. ALFRED GRADENWITZ.

A very convenient type of portable wireless telegraph station was described by the author some time ago in these pages. The Wireless Telegraph Company, of Berlin, who were the constructors of these stations, have recently designed another type of such lightness as to require no carts in their transportation.

Chiefly remarkable in this portable outfit are the means of generating energy. A bicycle dynamo is used. The constructive principle of the latter is simple. A small direct-current dynamo of about 100 watts output is fitted to a bicycle frame. The rider, if he may be so called, keeps the machine going by smart pedaling. From the sprocket of the bicycle frame the movement is transmitted to the dynamo by means of a belt, driving a specially-designed aluminium disk, the ratio of transmission being so designed as to have the dynamo produce sparks of 4 millimeters length in the induction coil, in normal operation. As the dynamo is located in front of the operator, the latter is in a position at any moment to supervise its uniform activity. The weight of the dynamo outfit is 30 kilogrammes (66 pounds). In the place of the device above described, a stationary motor cycle with a dynamo fitted on can be used. Apart from the dynamo a portable accumulator battery can be made use of to supply the energy required. The battery includes eight cells (16 volts), possessing a capacity of about 30 ampere-hours with a five hours' discharge. The admissible limit of discharging intensity is about 25 per cent greater than the energy necessary in normal working order. The cells are inclosed in an ebonite box, which is in turn divided into two compartments of 30 kilogrammes (66 pounds) weight each.

A CLEVER MECHANICAL AND ELECTRICAL AUTOMATON.

An interesting, novel, and pseudo-scientific attraction has recently been entertaining London audiences at the Hippodrome variety theater. This is a cleverly-constructed figure which apparently walks and writes automatically. It is called "Enigmarelle," and is seemingly a mechanical and electrical combination. The figure stands exactly six feet in height, weighs 198 pounds, and is composed of 365 distinct and separate parts. As to composition, the feet are of iron, the lower limbs of steel and wood, while the arms are of steel and copper. The body is an insulated steel wire frame, cased with fiber and rawhide, while the head is of wax. The figure contains seven motors, three of which are spring and four electric. They are distributed in different parts of the body and are said to operate the various members assigned to them in the following manner:

The two most powerful motors, which are of special design, propel the lower limbs, and cause the automaton to walk. A third operates the arms, a fourth the balance weights. Of the spring motors, the first controls the head, the second acts as an auxiliary to the electric motors in the movement of the arms, while the third operates the wire bobbins, which wind and unwind with the ever-changing position of the weights.

There are fourteen dry storage battery cells of small capacity. They are of special design and constructed to serve a double purpose—not only to furnish power to the motors, but also to maintain the equilibrium of the figure. A little below where the hip joint would be on the left of the figure, is the terminal of a semi-circular vulcanite track, which passes up and over the upper part of the chest, de-

(*Continued on page* 57.)

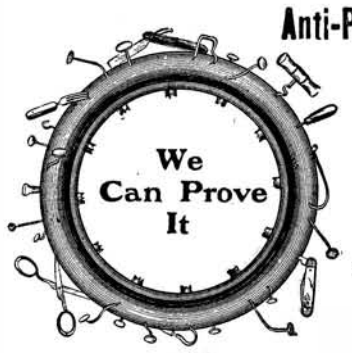
Automaton Writing. Chest Mechanism Exposed.

Introducing "Enigmarelle."

The Automaton Riding a Bicycle.

A CLEVER MECHANICAL AND ELECTRICAL AUTOMATON.

Anti-Puncture



Guarantees Your Tires Puncture Proof. Thousands Use it.

Send for Our Booklet

AMERICAN ANTI-PUNCTURE TIRE CO.
1693 Broadway, New York

The Continental Calliope

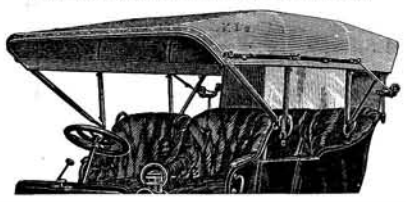
(The Latest Orchestral Chime Horn.)

MANUFACTURED BY

The Motor Car Equipment Company
Manufacturers and Importers
Automobile Accessories
55 Warren Street, NEW YORK, U. S. A.

AUTO TOPS

We make every class of top for your automobile from a $65 folding to a Limousine body at $1500.



Cape Tops, Canopy Tops, Semi-Enclosed Tops Limousine bodies.

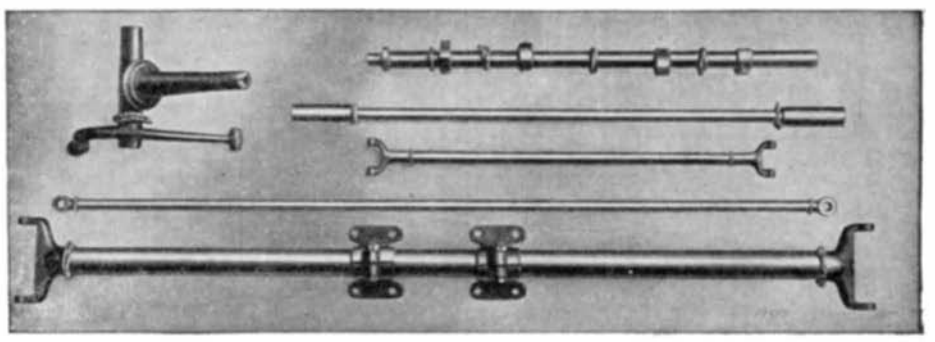
THE AUTO-TOP COMPANY OF NEW YORK
1655 Broadway, New York City

Automobile Bargains

AUTOMOBILES BOUGHT AND SOLD OR EXCHANGED

WE are the largest dealers of new and second-hand automobiles in America. Always have on hand from 200 to 300 machines from $100 to $500, every make. Write for bargain sheet describing cars on hand.

TIMES SQUARE AUTOMOBILE CO.
164 West 46th Street, New York City
"The place to save money"



That Helping Hand—Electric Welding

Motor Car Manufacturers, Take Notice!

This illustration will give you an idea of how helpful this new and modern process of welding can be in the construction of special shaped parts.

THE STANDARD WELDING CO. Cleveland, U. S. A.

WE ARE NOW SUPPLYING THE SAFEST, MOST COMFORTABLE, AND THOROUGHLY PRACTICAL TIRE MADE IN THE WHOLE WORLD

Their High-Grade Quality—"FISK" Quality—Insures Durability. Their Construction is a Positive Guarantee against Accident
"FISK TIRES MAKE SATISFIED BUYERS"

FISK RUBBER CO., Chicopee Falls, Mass.

CONTINENTAL TIRES

Continental tires are built to insure a maximum of utility and a minimum of dissatisfaction. Judged upon a basis of service, they are the best and *least costing* tires in the world. The high quality of the rubber, the splendid durability of the fabric, place them in a class where there can be only *comparison* and never *duplication*.

A speedy tire. A lasting tire. A perfect tire
INSIST on having them on *your* car.

Send for Booklet 11 to
Continental Caoutchouc Co.
EMIL GROSSMAN, Gen'l Mgr.
43 Warren Street, New York
Factory: HANOVER, GERMANY

The Holsman Automobile

Four years of Success. Clears the center of the road by eighteen inches, and therefore has **twice the advantage** of the ordinary machine. Large wheels, solid rubber tires, air-cooled. **Rides like a carriage.** The Holsman exclusive patent marks an era in automobile building. Does away with differential gears, friction clutches, pipes, pumps, etc. Reverses without extra gears. **No freezing; no punctures; no odor.** Send for catalog D.

THE HOLSMAN AUTOMOBILE COMPANY
Room 662 Monadnock Block Chicago, Ill.

HOME MADE DYNAMOS. — SCIENTIFIC AMERICAN SUPPLEMENTS **161** and **600** contain excellent articles with full drawings. Price 10 cents each, by mail. Munn & Company, 361 Broadway, New York City, and all newsdealers.

KNOX WATERLESS

Don't fail to inspect our new leaders.

4 Cylinder, 35-40 H. P.
2 Passenger Tourist

Commercial
Three Ton Truck

Oldest and largest builders of commercial cars.

We exhibit at Madison Square Garden only January 13-20th.

KNOX AUTOMOBILE COMPANY
Springfield, Mass.
Member of A. L. A. M.

YOUR HOUSE, APARTMENT, STORE, BANK OR OFFICE

Thoroughly Cleaned in One Day.

We will send our cleaner to your address, put a hose through the window and actually pump out all the germ-laden dust and dirt without taking up a carpet or upsetting your household or business arrangements.

Our wagon, with the cleaner, stands for **Progressiveness.**

BUILDINGS
Cleaned by the Vacuum Cleaner
ARE MORE HEALTHFUL.

Tell us what you want done, and we will send full particulars and estimate.

Telephone 2854 Chelsea.

VACUUM CLEANER CO.
130 W. 18th St., New York.

GEER GREEN EGG MOTORCYCLE

5 H. P. Double-Cylinder.
$225.00
WRITE FOR CATALOGUE
HARRY R. GEER CO.
1015 Pine St.,
St. Louis, Mo.

RADIUM AND THE RADIO-ACTIVE Substances. No better or clearer scientific account has been published than that contained in SCIENTIFIC AMERICAN SUPPLEMENT **1429.** The paper presents all that is at present known about radium and the radio-active substances. Price 10 cents, by mail. Munn & Co., 361 Broadway, New York City and all newsdealers.

Eureka Auto Jack No. 3

Patented September 22, 1903

This auto jack is a little wonder. Light in weight but strong in lifting power. Small in size but will easily lift a heavy car. Weight four pounds, capacity 2000 pounds. Handle detachably connected. Raises or lowers by using same handle. To pump down it must be under a weight of at least 25 pounds. Directions: to raise a weight, press down on the little steel lever and lock it out by turning to the right or left. To pump down, release the little spring lever.

EUREKA MOWER CO.
Utica, N. Y., U. S. A.

TO FILL
The ORIGINAL and ONLY GENUINE
CONKLIN'S
SELF-FILLING PEN

Simply dip in the ink, press with the thumb, and the **CONKLIN PEN** is filled and ready for instant use. It is simple, convenient, efficient, with no complex mechanism and nothing to get out of order.

The elastic ink reservoir is compressed by the presser bar under the thumb, and, when released, instantly draws in the ink through the feed channels at the point. The quickly adjusted lock-ring prevents ink from being forced out again. Feeds regularly until the last drop of ink in reservoir is used. Always responds without kick or balk. Cleans itself as easily as it is filled. Fully guaranteed.

If your dealer does not handle the **CONKLIN PEN,** let us make you our *Special Offer to Fountain Pen Users.* Full information, with illustrated catalogue, sent upon request. **Sold by dealers everywhere.**

THE CONKLIN PEN CO.,
514, 516, 518 Jefferson Ave.,
Toledo, Ohio.
93 Reade St., New York.
1652 Curtis St., Denver.
414 Market St., San Francisco.
American Agencies, Ltd., 88 Shoe Lane, Fleet St., London, E. C., Eng. Rae, Munn & Gilbert, 47 Market St., Melbourne, Aust.

RECENTLY PATENTED INVENTIONS.

Of Interest to Farmers.

EGG-CASE-CARRYING ATTACHMENT FOR VEHICLES.—R. N. Story, Clay Center, Kan. The aim of this improvement is to provide a novel simple case-holder that may be readily and securely mounted and detachably secured upon the rear portion of a buggy or a like vehicle, and thus afford reliable means for conveniently placing and holding an egg-case on the vehicle for transportation of the filled case to a market for the eggs.

BEEHIVE.—J. F. Stills, School, Ill. The aim of this improvement is to produce a moth-deceiver attachment which acts for such purpose and also serves as a rest or support for the frames, and also to produce a separator-board whereby the size of the colony may be accommodated and regulated, and also to produce a beehive the general make-up of which will facilitate the handling of bees.

FENCE-POST.—S. H. Summerscales, Winnipeg, Canada. This invention relates to a supporting device which although capable of general use is especially adapted for use as a fence-post. Among the other uses to which it may be put are the supporting of walls, floors, ceilings, roof materials, and railroad-rails. The principal objects are to provide a support of non-inflammable material which is not subject to decay on account of the action of the elements and which will avoid many well-known difficulties.

BROODER-COOP.—T. O'Brien, Branford, Conn. The coop is arranged to insure proper ventilation and to provide a clean and healthy brooding-compartment for a hen and a separate scratching-compartment for chicks, to allow the latter to readily pass from the brooding to the scratching-compartment, and vice versa, and to allow the chicks to scratch and feed in the scratching-compartment in all kinds of weather without annoyance from the sitting hen or chickens from other coops, and to protect the chicks from attack at night or day from enemies of the chicks.

HARVESTING-MACHINE.—W. Livtschak, Wilna, Russia. In this patent the invention relates to improvements in harvesting-machines whereby the construction of the machine is simplified and a new combination of known devices is produced, so that the usefulness of the machine is considerably increased. The machine is suitable for all kinds of crops, also for grass.

Of General Interest.

WALL-COVERING.—T. Cleary, Schuylerville, N. Y. In this instance the object of the invention is the provision of a new and improved wall-covering which has a highly ornamental plush effect. The invention consists of a new article of manufacture—namely, a wall-covering consisting of a fabric body and coating thereon in plush effect.

HOISTING DEVICE.—P. A. Gould and G. R. Watson, Saranac Lake, N. Y. This device is for facilitating the raising of heavy weights. It is especially useful in lifting transformers to attach them to electric-light poles. One object is to produce a device which may be readily set up temporarily upon an electric light pole for the purpose suggested. A further object is to so construct the device that it readily adapts itself to the construction work at the top of an electric-light pole, enabling the device to be readily applied to poles of different kinds or having cross-arms differently arranged.

COMBINATION-TOOL.—E. Hogan, Portland, Ore. This tool is capable of many uses. It may be used as a level to level in all directions without moving the tool. Difference between low and high points in degrees may also be determined. It may be used as a plumb to plumb at any angle without moving the same and to determine the amount of angular deviation of objects. It levels and plumbs one way and any angle desired at right angles at the same time without moving the tool.

ARCH-FILE.—R. H. Johnson, Jersey City, N. J. This improvement refers to a file for securing loose leaves. The principal object is to provide means whereby the distance from each other of the arches or other holding devices for the file can be varied at will to accommodate different punchings in the sheets to be held. Means provide for easily detaching the arches from the main body of the holder and readily slipping the articles to be held onto them.

HEAD-REST.—F. M. Kandle, Atlantic City, N. J. In the present invention the improvement is in head-rests intended especially for barbers' chairs, being in the nature of a flexible cover for the ordinary head-rest provided with means whereby it may be secured in place upon the head-rest and with openings through which a sheet of paper forming a sanitary cover may be passed and with means for supporting a package of paper.

CONDENSER.—F. Kaiser, New Orleans, La. This improvement is in surface condensers intended especially for condensing and cooling ammonia-gas, but may be used for condensing steam or for use in any other suitable heat-exchanging apparatus. It relates particularly to the sets of condensing-tubes and the construction whereby they are secured within the shell, so the tubes can be readily assembled, can be conveniently inserted or removed from the shell, and can be securely packed in such shell to prevent any leakage, and will compensate, in a measure, for variation in expansion and contraction between such tubes and the shell of the condenser.

ATTACHMENT FOR FRUIT CANS AND JARS.—C. M. Leffingwell, Littlefalls, Minn. Briefly stated the improved attachment invented by Mr. Leffingwell holds fruit submerged below the surface of the juice and also serves as a mold-extractor in case mold forms, since it may be readily lifted out of the jar with the mold adhering thereto.

CHEMICAL CHART.—C. D. Poore, Minneapolis, Minn. Mr. Poore's invention relates to charts, and more particularly to a chart specially arranged for work in chemistry, the arrangement being such as to assist the investigator in determining the composition of certain compounds in formulating appropriate chemical terminology for compounds of known composition and in studying chemical reactions.

Machines and Mechanical Devices.

SHARPENING-MACHINE FOR DRILL-BITS.—T. H. Proske, Denver, Col. The invention relates to sharpening-machines for drill-bits, such as shown and described in the Letters Patent of the United States, formerly granted to Mr. Proske. The object of the present invention is to provide a machine arranged to permit of sharpening various sizes of drills in a single pair of dies by the use of different-sized dollies, the sharpened drills being accurate and regular both in gage and form to insure drilling of straight holes without danger of the drill sticking in the hole.

SOAP-MACHINE.—N. G. Knight, Crestline, Ohio. In this case the improvement refers to machines for effecting saponification, and has for its principal objects the provision of a convenient arrangement of gearing for driving the rotatable elements and means for introducing material during the operation of the machine.

KEY-SEATING DEVICE.—I. W. Jones, Birmingham, Ala. Chief objects of this invention are to so construct a cutter-holder as to permit a straight and readily detachable and replaceable cutter to be employed, to permit the holder to be made practically solid from the cutter to the end, to secure a solid and strong abutment for cutter to bear against while operating, to place the feeding mechanism for cutter above the cutting edge, to provide the feeding-pin with means for increasing tension of relieving action at the time when tension is most needed, to avoid putting strain on the feeding mechanism while cutter is operating, and to make the bar strong and protect all parts from chips.

BELT-GUIDE.—M. E. DeGree and D. C. McAlister, Flaxton, N. D. The principal objects of the invention are to provide means for guiding a belt to or from a pulley, even when the two pulleys over which the belt passes are not of alinement, to provide means for preventing the belt from being thrown from the pulleys under any circumstances, and to guard against any cutting action upon the belt or any unnecessary wear thereof.

Medical Appliances.

RECTUM-SUPPORTER. — E. H. Higbee, Roodhouse, Ill. The purpose of the invention is to provide a practical, light, and simple appliance especially adapted for the relief and cure of prolapsus of the rectum and hemorrhoids or piles and to so construct the appliance that it may be worn with comfort and may be partially removed in an expeditious and convenient manner when occasion demands.

SURGICAL APPLIANCE.—H. T. Foote, New Rochelle, N. Y. The object of this inventor is to provide a device for preventing nocturnal emissions of the male human being, the device being simple and durable in construction, designed for convenient attachment and removal, and arranged to prevent pressure on the dorsal veins of parts, and allowing the wearer to urinate while the device is in position.

Prime Movers and Their Accessories.

ROTARY ENGINE.—G. L. Loper, Norcatur, Kan. In this patent the invention consists in the novel construction and arrangement of parts acting upon the general principle in relation to rotary engines of that class in which the outside casing revolves and the steam is admitted to the same through a central core having steam-ports.

Pertaining to Recreation.

BOW-FACING OAR.—G. M. Kerry, Boyne, Mich. In operation the gunwale-plate is clamped to the gunwale and the thole-pin is passed through the opening in the bottom of the groove and into the gunwale, the body portion of the yoke engaging the groove to prevent rotation of plates. Moving the handle-sections in the usual manner will produce a reverse movement of the blades. Dipping of the blade is permitted by hinging of the plates to the yoke. To convert bow-facing into stern-facing oars, it is only necessary to remove the gunwale-plate and insert cotter-pins.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(9868) J. T. asks: I would like to ask you if you can give me a formula for sensitizing porcelain with a solution and then electroplate it with copper? A. An article of porcelain which is to be plated with copper may first be coated with a tough varnish such as copal, and when the varnish is dry it should be thoroughly covered with plumbago as a basis for the copper plating. Sometimes a flashing of gold is burnt on and the copper is deposited upon the gold. This makes a firmer deposit than is possible with varnish. For details of all such processes see Watt and Philip's "Electroplating."

(9869) W. A. M. writes: Some time ago you published certain notes showing how to calculate the dates on which Easter will fall, which were very interesting, but obviously incomplete, it being necessary to consult a calendar to find the day of the week corresponding with the date arrived at by the calculation. If you have a calendar for the year, there is no need for your rule, it is easier to turn up March and April and find it all worked out for you. If you have not the said almanac, how do you proceed? The following is my way of finding the day of the week for any date, or conversely the date of any day in any year. I use the following motto, "Queen Woman Wins by Subtlety," because the vowels *a, e, i, o, u, w, y* are incorporated in the order to show the date of the first Thursday in each month of the year 1905; thus, the first vowel used in the motto is *u*, representing the first month, the second vowel *e* stands for the second month, and so on, until the twelfth vowel *y* in the motto stands for the twelfth month. Next the *u* representing the first month is the fifth in the order *a, e, i, o, u, w, y*, and the first Thursday of the first month of 1905 was the fifth. The fourth vowel is *w* for the fourth month; the first Thursday in fourth month was on the 6th, *w* being the sixth in the order *a, e, i*, etc. The ninth and twelfth months are each represented by the ninth and twelfth vowels *y*, which is the seventh in the order *a, e i, o*, etc., showing that the first Thursdays in the ninth and twelfth months fall on the 7th. The motto easily lends itself to division; thus the word "Queen" is the first three months, "Woman" the second three months, "wins by" the third quarter, and "subtlety" the last three months of the year. Example 1. What day of the week will be December 28, 1905? The vowel for the twelfth month is *y*, the seventh in the order *a, e, i*, etc., therefore the 7th, 14th, 21st, and 28th December are all Thursdays. Ex. 2. What day of the week will be September 4, 1905? September is the ninth month. The ninth vowel is *y*, therefore as Thursday is the 7th, Monday will be 4th. Ex. 3. What will be the date of the third Monday in June, 1905? June is the sixth month, the sixth vowel is *a*, showing that Thursday was the first (*a* being the first in the order *a, e, i*, etc.) and Monday the fifth. The third Monday in June, 1905, was the 19th. It must be remembered that the dates given in the motto are Thursdays for 1905. They will be Fridays in 1906, and Saturdays in 1907, in 1908 they will be Sundays, until February 28, after which they will be Mondays, and so on forever, constituting a perpetual calendar. Ex. 4. What day of the week was March 21, 1818 (the day on which your rule for finding the date of Easter shows to be the date of full moon in that year)? Rule. To the difference between the years, add the number of leap years that have intervened, divide by seven, and count back as many days as the number remaining. This will give the day for the year, and proceed as above. Thus, 1818 from 1905 leaves 87, add 21 leap years, making 108, dividing by 7, leaves three of a remainder. Three days back from Thursday (the day for 1905) gives Monday as the day for 1818, that is, the dates given by the motto were Mondays in that year. Now March is the third month, and the third vowel in the motto is *e*, the second in the order *a, e, i*, etc. The first Monday in March, 1818, was the second day of the month, and the 9th, 16th, and 23d were also Mondays, and the 21st was Saturday, next day Sunday—the earliest possible date for Easter. To find the day for any future year, proceed exactly as in Ex. 4, but count forward the number of days shown by the remainder. A. This ingenious scheme is adapted perfectly to all years in which January 1 is Thursday; but for other years some calculation is required. It does not fix Easter day. As we have said before, Easter cannot be fixed by persons not familiar with the motions of the moon. The best way to find Easter for any year is to refer to an Episcopal Prayer Book, which gives the date for several centuries.

NEW BOOKS, ETC.

Oil Colors and Printers' Inks. By Louis Edgar Andés. New York: D. Van Nostrand Company, 1904. 12mo.; pp. 212. Price, $2.50.

This is a practical handbook treating of linseed oil, boiled oil, paints, artists' colors, lampblack and printers' inks, black and colored. In addition to information with regard to linseed oil, the chief raw material, its purification, and bleaching for making varnishes and pigments, the book contains short dissertations on the theory of drying oil, of the pigments that can be used with it, and the chief adulterations. A special chapter is devoted to lampblack. Attention is given to the manufacture of pigments, their mixing and grinding, and to the manufacture of printers' varnishes and colored inks, including all the latest patented products. The section dealing with artists' colors is quite new, and will not be found in any other work of this kind. The author has been engaged for a number of years in the manufacture of varnishes, pigments, and colored printing inks. Fifty-six illustrations accompany the text.

Civil Engineering. A Textbook for a Short Course. By Lieut.-Col. G. J. Fiebeger, U.S.A., New York: John Wiley & Sons, 1905. 8vo.; pp. 573. Price, $5.

This textbook is designed primarily for the cadets of the United States Military Academy, who have been fitted for a profession in which the principles of civil engineering are of daily application. In time of peace the officer in an isolated station finds himself called upon to act as engineer and constructor of buildings, roads, and bridges. If not the engineer charged with the construction of water works and sewerage systems, he finds himself charged with their maintenance and repair. In time of war a knowledge of the construction of buildings and bridges enables him to effect their destruction without loss of time or the aid of skilled workmen. The entire subject of military engineering, including fortification, sapping, mining, pontoneering, etc., is simply the application of principles of civil engineering and tactics to military problems. For the above reasons the faculty of the Military Academy has always provided a short course in civil engineering, and it is for the use of these students that this book was primarily written. The author is Professor of Engineering at the United States Military Academy, and he has produced a most valuable textbook.

An Introduction to the Design of Beams, Girders, and Columns, in Machines and Structures. With examples in graphic statistics. By William H. Atherton, M.Sc. London: Charles Griffin & Co. Philadelphia: J. B. Lippincott Company, 1905. 12mo.; pp. 236. Price, $2.

The design of beams in relation to strength and stiffness and convenience of construction is a study that appeals to all classes of engineers and architects, for in all machines and structures beams appear in one form or another, and little progress can be made in scientific designing without a proper understanding of the principles or fundamental facts underlying their construction. Hence great prominence is rightly given to this subject in a course of applied mechanics, machine and building construction, and naval architecture. As denoted by its title, this book is extremely introductory in its aim and scope. A careful examination of this book shows that the author has produced a conscientious work, which cannot but prove of value to the student.

Earth and Rock Excavation. By Charles Prelini, C.E. New York: D. Van Nostrand Company, 1905. 8vo.; pp. 357. Price, $3.

The author justly states in his preface that there is hardly a class of engineering construction into which the excavation of earth or rock does not enter to some extent, and, in many engineering works, excavation is by far the largest item of labor and expense. Despite these facts English engineering literature is almost barren of books which treat of earth and rock excavation in a concise and comprehensive manner, having regard both for the planning and computation of such work, and for the methods and machines by which it is accomplished. The present book is an attempt to supply this deficiency, and has been written with the following objects chiefly in view: First, to concentrate in a small volume descriptions of the various operations which are required for planning and executing any work of excavation in earth or rock; second, to classify and describe clearly the various implements and machines used for excavating and hauling away the material. So far as the author knows, there is no publication in the English language which gives these facts. An examination of the books shows that the practical side is in no case neglected for the theoretical. It is a good addition to the literature of engineering.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**
MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 7660.—For makers of oil burner capable of use in a wood heater.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 7661.—Wanted, a manufacturer to make pressed paper tubing, particularly strong and durable, 140 millimeters inward clear diameter and corresponding thickness, to bear inward pressure of nearly 200 atmospheres; tubes to be about 120 centimeters long.

Drying Machinery and Presses. Biles, Louisville, Ky.

Inquiry No. 7662.—For makers of portable table to be attached to any chair.

WANTED.—Purchaser for Monazite, Molybdenite and Wolfram. Apply Monasite, Box 773, New York.

Inquiry No. 7663.—For manufacturers of powder in bulk, made from silica rock.

I sell patents. To buy, or having one to sell, write Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y.

Inquiry No. 7664.—For manufacturers of machinery for making, nailing, etc., wooden boxes, as large as 29 x 19.5 x 11.7 inches.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company, Foot of East 138th Street, New York.

Inquiry No. 7665.—For manufacturers of pins.

WANTED.—Ideas regarding patentable device for water well paste or mucilage bottle. Address Adhesive, P. O. Box 773, New York.

Inquiry No. 7666.—Wanted, makers of small water tube boilers for marine use.

I have for sale the U. S. and all foreign rights of new patent Improvements in Water Tube Types of Boilers. Great economizer. J. M. Colman, Everett, Wash.

Inquiry No. 7667.—For manufacturers of dental goods, such as teeth and filling materials.

Young American permanently residing in Lima, Peru, S. America, wishes to hear from firms interested to be represented there. Further information. F. Thorn, Milford, Mass., P. O. Box 18.

Inquiry No. 7668.—For parties engaged in erecting fire escapes.

FOR SALE — PATENTS. — Life saver; great money maker; it is a great invention; something never introduced before; can be seen; only buyers. Apply by letter, Nicholson, 651 3d Avenue.

Inquiry No. 7669.—Wanted, addresses of makers of two-cycle gas engines.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery tools and wood fibre products. Quadriga Manufacturing Company, 18 South Canal St., Chicago.

Inquiry No. 7670.—For dealers in name plates, trunk checks, old badges, etc.

PATENTS.—Wanted, the service of a patent expert and experienced specification writer. No one need apply who has not had a thorough education along technical lines, and who has not had experience in patent practice. Munn & Co., 361 Broadway, New York.

Inquiry No. 7671.—For manufacturers of producer gas machines.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 7672.—For manufacturers of astronomical telescopes.

Inquiry No. 7673.—Wanted, manufacturers of railroad iron.

Inquiry No. 7674.—Wanted, makers of elastic bed mattresses and pillows.

Inquiry No. 7675.—Wanted, name and address of the makers of the Electric Shoe-shining Machine.

Inquiry No. 7676.—For makers of wire artists' supplies, such as jewelry and beads.

Inquiry No. 7677.—Wanted, a 1,000-foot gas holder.

Inquiry No. 7678.—Wanted, hand knitting machines for cheap cotton stockings.

Inquiry No. 7679.—For makers of thermostats and heat regulators.

Inquiry No. 7680.—For manufacturers of molds for molding plaster.

Inquiry No. 7681.—For dealers in crude rubber.

Inquiry No. 7682.—Wanted, manufacturers of glass bottles.

Inquiry No. 7683.—For dealers in Canada or Brazil wax.

Inquiry No. 7684.—Wanted, makers of machines for weaving "K" woven wire fence.

Inquiry No. 7685.—Wanted, catalogues of the latest fire extinguishers by carbonic acid or other chemicals.

Inquiry No. 7686.—Wanted, makers of advertising clocks, about 6 feet high by 2 feet wide.

Inquiry No. 7687.—Wanted, a pump for drawing water out of a suck line for natural gas.

Inquiry No. 7688.—Wanted, machines for drying, cutting and evaporating fruits.

Inquiry No. 7689.—Wanted, makers of apparatus suitable for general metallurgical and heating purposes.

Inquiry No. 7690.—For makers of parts with which to construct a dynamo.

Inquiry No. 7691.—Wanted, recipes for making first-class rubber-stamp ink.

Inquiry No. 7692.—Wanted, recipes for making colored mill crayons.

Inquiry No. 7693.—Wanted, makers of hosiery machines, also of a machine by which 2 to 8 dozen Guernsey frocks can be made in 8 hours.

Inquiry No. 7694.—Wanted, a cement-making apparatus for mixing rubber cements.

Inquiry No. 7695.—Wanted, the name and address of the makers of the celebrated Chime Hall Clock movements, tubular chimes.

Inquiry No. 7696.—For makers of novelties or aluminum goods.

Inquiry No. 7697.—For makers of coal oil stove burners, also crude oil stove burners.

Inquiry No. 7698.—For manufacturers of induction coils.

Inquiry No. 7699.—Wanted, address of parties who bend sled runners.

Inquiry No. 7700.—For manufacturers of peppermint.

Inquiry No. 7701.—For manufacturers of nails, saws, wire, hinges; also cotton goods.

Inquiry No. 7702.—For manufacturers of ball-bearings.

THE MARMON AIR-COOLED TOURING CAR.

(*Continued from page 28.*)

necessary, but the large expanding-ring brakes in the rear wheels are usually ample. The rear axle has an aluminium gear case, whose two halves are cast upon two axle sleeves, thus making an integral piece of each. The wheels and differential revolve on Hyatt roller bearings. Floating interior half-axles drive the wheels through jaw clutches on the hubs. The thrust of the bevel pinion is taken up by a rolling contact of the pinion against the bevel gear—a very simple arrangement.

Aluminium is used wherever possible throughout the car. The body is constructed almost entirely of cast aluminium, as is also the dash and fenders. Vertical fenders from running board to body are one of the good features, as they keep down both dust and mud. The entire machine, with the exception of wheels and tires, is constructed in the large new addition the company has made to its plant for this purpose. The car is one of the best-built air-cooled machines on the market. That it can make fast time under all ordinary circumstances was demonstrated by its performance in the economy test held last November.

NEW FOUR-CYLINDER AIR-COOLED MOTOR,

(*Continued from page 29.*)

fit into notches in the shifter bars to locate them securely when the gears are completely in mesh. The bars are shifted by a single hand lever working in an H-shaped quadrant on the selective system. The selecter box is dustproof, and contains a simple device which positively locks, in their neutral position, all the shifter bars except the one in use.

This transmission is modeled after the latest Mercedes speed-change gear. The shafts run on the non-adjustable ball bearings (which are also used on the road wheels), and the differential countershaft across the rear of the transmission is used for transmitting power to the wheels by means of sprockets and chains. The outer ball bearings of the countershaft are exactly under the sprockets. The advantages claimed for the transmission are that the divided shaft with one part running on the other (which makes a bearing difficult to oil and subject to great wear) is entirely avoided, while the shafts are much shorter between bearings, and hence have no tendency to spring while the intermediate gears are in use.

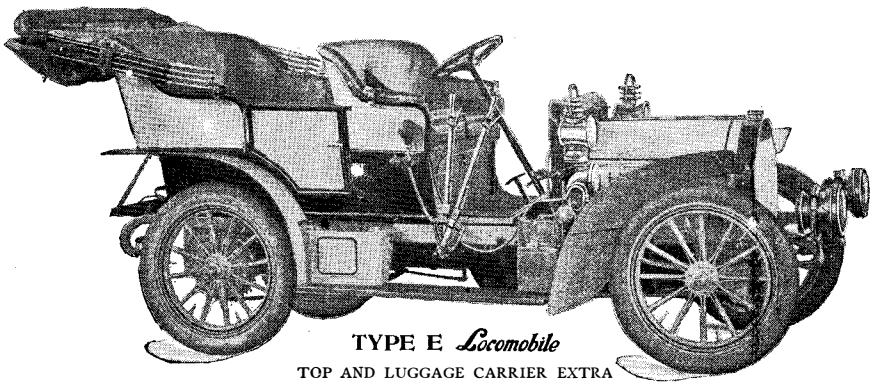
Six years ago the Knox Company built their first machine, fitted with a single-cylinder air-cooled motor of 4 horse-power. This was the first slow-speed motor of large bore and stroke to be made commercially successful. It was superseded by still larger motors of the double-opposed, horizontal type, and this year a still larger vertical, four-cylinder motor has been placed on the market. The cylinders of this engine have a 4¾-inch bore by 5½-inch stroke. They are cast separately, and besides having reinforcing ribs near their base, they have about one-third fewer pins per square inch of cylinder surface, and the pins are about half the length of those that were used heretofore. Experiment has shown that the Knox cylinder is more efficient when a lesser radiating surface is used. As heretofore, everything is very substantial about the Knox car. The 1⅝-inch crankshaft is supported in five separate bearings attached to the upper half of the crankcase. These bearings are 3 and 4 inches long, and those of the hollow wrist pins are 2¼ inches long. The valves, which are located in the cylinder heads, are 2 inches in diameter and interchangeable. They are made of a special steel and nickel alloy. Each valve cage fits into a pocket, from which it may be removed without disturbing any of the connections, and simply by unscrewing one nut. The valves can, therefore, be ground outside of the engine. Separate camshafts operate the inlet and exhaust valves, by means of push rods and rocker levers. Special auxiliary coil springs are

Locomobile

"Easily the Best Built Car in America"

30-35 H. P., $5,000 **15-20 H. P., $3,000**

These models are almost identical in design; contain the same carefully selected materials; and are constructed throughout with equal care. Both models are furnished with complete touring equipment



TYPE E *Locomobile*
TOP AND LUGGAGE CARRIER EXTRA

Specifications of Type "E" 15-20 H. P. *Locomobile* Price $3,000

EQUIPMENT, 5 brass lamps; horn; tire carrier; jack; tools and extra parts; locked box with trays for tools and parts; compartment carrying 4 tin cases for extra lubricants.
MOTOR, 4-cylinder, 3¾" bore, 4½" stroke; manganese bronze base; gears enclosed. Same general type as made by us for four seasons.
CRANK SHAFT, machined from one solid forging.
CAM SHAFTS, hardened ground forgings—one solid piece.
CARBURETER, automatic type with balanced throttle valve.
IGNITION, make-and-brake system used by us for the second season. Ignition cams solid with admission cam shaft which slides in bearings to advance or retard spark.
MAGNETO, low tension, our design; permanent magnets from the best makers in the world; impossible to disturb any electrical adjustments by removing or replacing magneto. Oil proof armature.
LUBRICATOR, large mechanical oiler. Large supply pipes.
GOVERNOR, centrifugal type, prompt and positive in action.
CONTROL, gas and spark levers on steering wheel.
CLUTCH, cone type with ample leather face.
UNIVERSAL JOINT, between clutch and transmission.
TRANSMISSION, 3 speeds and reverse; direct drive on high gear; clutch shifting mechanism, gears, bearings, and differential all encased and lubricated by same oiling system.
DRIVE, double side chains; hardened sprockets.
RUNNING BRAKE, double acting type; 3½" x 10" located on differential shaft, metal to metal surfaces.
EMERGENCY BRAKES, internal expansion type, compensated. Large and powerful, metal to metal surfaces.
SPROCKET DRUM, bolted to each rear wheel spoke.
AXLES, "I" section axles front and rear.
TIRES, 32" x 4" on all four wheels. Larger than the size recommended by the Tire Association.
BODY, double side entrance, seating 5; extra wide doors; fitted with top irons; color and striping optional; running boards, covered with pyramid rubber bound with brass.
WHEEL BASE, 93".

NOTE.—Our 30-35 H.P. ***Locomobile*** Type "H" **$5,000**, is intended for those requiring greater power and greater seating capacity. The specifications are the same as those printed above with the following exceptions: Motor 4½-in. bore, 5½-in. stroke. Body seats 5 to 7 persons; Tires, 34 in. x 4½ in., front and rear; Wheel Base, 106 in. Full illustrated descriptive matter of both cars on application to factory or any branch office.

For 12c. in stamps we will mail 12 souvenir postal cards showing 12 different views of the ***Locomobile*** running in the Vanderbilt Cup Race, making the best showing of any American car in any international contest. For 10c. in stamps we will mail a five-color poster showing the ***Locomobile*** finishing the race.

The *Locomobile* Company of America, Bridgeport, Conn.

NEW YORK, BROADWAY and 76th St. *Member Association of Licensed Automobile Manufacturers* **BOSTON, 15 Berkeley St.**
PHILADELPHIA, 249 N. Broad St. **CHICAGO, 1354 Michigan Ave.**

PATENTS
The Wealth of Nations

A PATENT gives you an exclusive right to your invention for a term of seventeen years. You can sell, lease, mortgage it, assign portions of it, and grant licenses to manufacture under it. Our Patent system is responsible for much of our industrial progress and our success in competing in the markets of the world. The value of a successful Patent is in no degree commensurate with the almost nominal cost of obtaining it. In order to obtain a Patent it is necessary to employ a Patent Attorney to prepare the specifications and draw the claims. This is a special branch of the legal profession which can only be conducted successfully by experts. For nearly sixty years we have acted as solicitors for thousands of clients in all parts of the world. Our vast experience enables us to prepare and prosecute Patent cases and Trade Marks at a minimum of expense. Our work is of one quality, and the rates are the same to rich and poor. Our unbiased opinion freely given. We are happy to consult with you in person or by letter as to the probable patentability of your invention.

¶ Hand Book on Patents, Trade Marks, etc., Sent Free on Application

MUNN & COMPANY
SOLICITORS OF PATENTS
Main Office 361 Broadway, New York
Branch Office, 625 F Street, Washington, D. C.

attached to the latter. The gears are all inclosed and run in oil. The camshafts may be easily removed, and the crank bearings can be adjusted through the inspection covers in the crankcase. High-tension magneto ignition is employed, the magneto being gear-driven direct from one of the camshafts. A coil is used in connection with the magneto, and the distributor on the same directs the current to the spark plugs of the various cylinders. A metal-to-metal cone clutch running in oil is located in the flywheel of the engine.

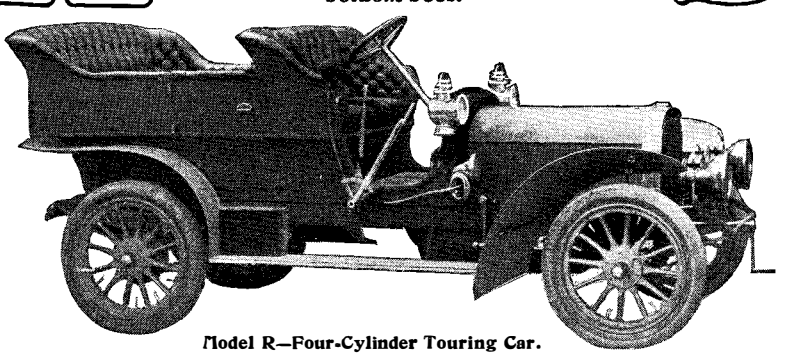
THE OLDSMOBILE TWO-CYCLE AND FOUR-CYCLE TOURING CARS.

(*Continued from page 30.*)

is placed between the engine and the transmission in addition to the two protected universal joints in the propeller shaft. The motor and transmission are mounted upon a sub-frame, which is suitably braced by steel plates riveted to the main pressed-steel frame. All working parts of the machine may be removed without disturbing the alinement of the crank and transmission cases. The radiator also is mounted on the sub-frame, for the purpose of doing away with excessive vibration of this delicate member. The running board and mud guards are attached by means of tapered sockets, which makes them readily removable. This is a minor distinctive feature of the new Olds car. The four-cylinder, four-cycle motor of the larger touring car also has several distinct features. In the first place, the oiling system is very complete. The oil is pumped from an oil well in the base through passages in the crankcase of the motor to all the bearings of the same. The lower half of the crankcase contains a certain amount of oil, the splash from which is used to lubricate the cylinders. The level is maintained in the base by means of holes leading to the oil well below, any overflow passing immediately into this reservoir. A positively-driven oil pump operated from the camshaft (which is hollow and also has oil forced through it for the lubrication of its bearings) circulates the oil through the passages of the crankcase. A glass bull's eye in the front of the case shows the amount of oil present at all times. In the bottom view of the chassis the oil well is seen as a long cylinder running the length of the crankcase. The water pump is also ingeniously housed in the rear end of the crankcase, where it is driven by gears. The view of the motor shows the cylinders to be cast in pairs, with all valves located on one side and mechanically operated from a single camshaft. The contact box is at the rear end of the motor on the top of a vertical shaft, driven by bevel gears from the camshaft. Jump-spark ignition with separate coils and both storage and dry batteries is used. The clutch is of the ordinary cone type, but it is equipped with a spring device which allows the load to be picked up slowly and without any jerks. The clutch cone carries a large grease cup for the lubrication of the bearing that the clutch revolves upon when it is not engaged. The exhaust and the inlet pipes of the motor can readily be removed by taking off the clamping piece held by two nuts. The valves can be removed through holes in the valve chambers, and the valve stems and their bushings can also be taken out by undoing the clamps which hold the latter in place. The crankcase bearings are supported on the upper part of the motor base, and the whole bottom half of the crankcase can be removed when it is desired to adjust these bearings. The steering gear of this touring car is very well designed and has small grease cups on all important joints, so that the wear can be minimized. All the steering connections are easily adjusted. An irreversible worm steering gear is used. The four-cylinder car has a 4¼ x 4¾-inch motor, capable of developing 26 to 28 horse-power at 1,000 R. P. M. The machine weighs about 2,000 pounds, has 106-inch wheel base, and is capable of speeds of about 50 miles an hour. The lighter two-cycle car weighs only 1,700 pounds, which, with its 25-horse-power motor, should make it a very speedy and capable machine over all kinds of roads.

HAYNES

"The Car the Repairman Seldom Sees."



Model R—Four-Cylinder Touring Car.

Vertical roller-bearing engines. Cylinders cast separately, 5⅛ x 6 inches, 50 H. P. An exclusive transmission that absolutely prevents stripping of gears. Positive cooling system. Individual and special lubrication. Master Clutch has metal faces and takes hold without jerking. Shaft drive. Exclusive universal joints that prevent wear on pins. Sprocket and Roller Pinion and perfect Rear Axle, all exclusive. Roller-bearings throughout. 108-inch wheel base, 54-inch tonneau, seating five people. Four to 60 miles an hour on high gear. Weight, 2,750 pounds. Price, $3,500 f.o.b. Kokomo. Full equipment.

THE EXCLUSIVE HAYNES TRANSMISSION.

If an automobile weighing 2,750 pounds, plus the weight of five passengers, is dropped over a sheer embankment of 7 feet, the machinery will receive a shock of just the same severity as if suddenly checked by shifting from high speed gear at 30 miles per hour to middle speed gear at 15 miles per hour. In the latter case, the engine must act as a brake, and the entire machine is severely strained. With the Haynes transmission, this cannot occur. A ratchet and pawl device permits the car to coast until the speed of the car and engine are relatively equal, when the pawls engage and the engines take up the load. While making the change in speed from high to middle or from high to low, the gears are running idle, permitting the operator to shift with perfect ease and without danger of burring or stripping the gears. With all forms of transmission except the Haynes, the shock of sudden change of gears may be, and frequently is, thrown upon the machine, a thing impossible in the Haynes car and one of the reasons why Haynes cars are so long-lived and cost so little for repairs and up-keep.

This is but one of the exclusive features of the Haynes. Others are its Roller-Bearing Engines, Master Clutch, Universal Joints that do away with wear on pins, Driving Sprocket and Roller Pinion, etc. There is perfect harmony throughout its entire mechanism, which makes its cost of operation, up-keep and maintenance extremely low.

It is perfectly finished in all respects. Only the best of tested materials are used. Body is of cast aluminum and wood, designed by a leading Parisian body maker. Hand-buffed leather and gray curled hair are used in upholstering. Other exclusive features are given in our new catalogue. For prompt attention address Desk 32.

HAYNES AUTOMOBILE CO.

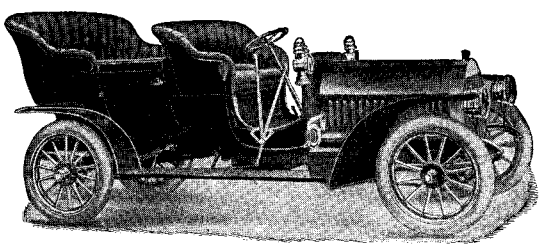
Oldest Automobile Manufacturers in America

KOKOMO, INDIANA

CHICAGO, 1421 MICHIGAN AVE. NEW YORK, 1715 BROADWAY

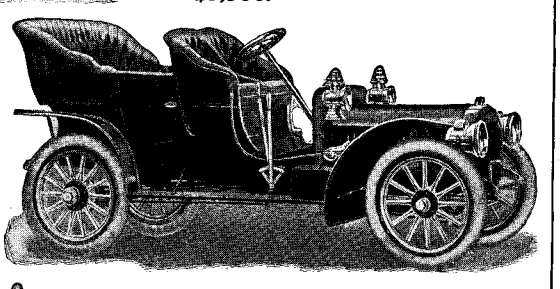
Members A. L. A. M.

Wayne

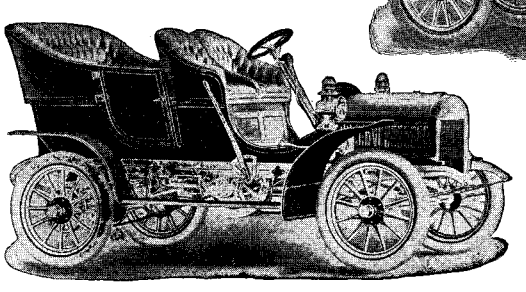


The four models we offer for 1906 are the result of mature experience They are not new and untried experiments. Each car is a distinct type of Wayne design and construction and each model has been built with a view to supplying the varied demand for high-grade machines. In the Wayne cars the automobilist will be sure to find a car suited to his needs.

Model F is a 4-cylinder car with cylinders 5½ x 5, cast in pairs and water cooled, Seating capacity, seven people. This car has full 50 H. P. Sliding gear transmission, with Hess-Bright ball bearings throughout. Tires 34 x 4½. Price, **$3,500.**



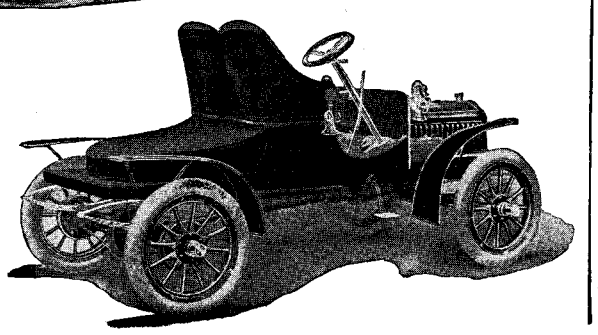
Model K is a 4-cylinder car with cylinders 4¾ x 5, cast in pairs and water cooled. Full 35 H.P. Sliding gear transmission. Three speeds forward and reverse. Equipment includes all necessary tools of the best quality, 2 side lamps, 2 acetylene head lights with generator, tail lamp and tube horn. Tires 32 x 4. Price, **$2,500.**



Model B, 4-cylinder. 5-passenger car, 24-28 H.P. Sliding gear transmission. Price, **$2,000.**

Model C is a 20 H. P. 5-passenger car. This car has the same double opposed motor which proved so successful last season. Two seasons' use of this type of machine has proved it an ideal family car, most economical in up-keep. Planetary transmission with chain drive. Tires 30 x 3½. Price, **$1,250.**

Model H is our 2-passenger runabout, Motor 2-cylinder opposed, under hood. Cylinders 4½ x 4, developing 14 H. P. Planetary gear transmission with DIRECT BEVEL GEAR DRIVE. The strong features of this car are extreme simplicity and accessibility. The crank case and transmission case form one casting, and the entire engine can be taken apart or assembled in half an hour. Price, **$800.**



Full particulars of all these cars and the name of our nearest agent will be given if you will write

WAYNE AUTOMOBILE CO.

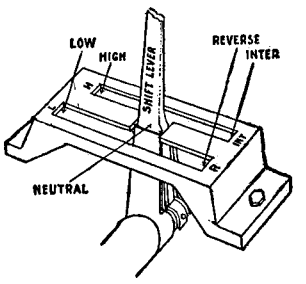
Dept. J. Detroit, Mich.

Member American Motor Car Manufacturers' Association

PEERLESS TOURING CAR.

(*Continued from page 31.*)

running in oil, and the object of the box being set at an angle instead of vertical is to keep the roller always submerged, which does away with trouble from arcing. The radiator is constructed of flat copper tubes connecting with the surrounding water tank, which is a solid casting. The gear-driven centrifugal pump, housed in the crankcase and running in oil, forces the cooled water from the bottom of the radiator up through the water jackets. The clutch is of the internal expanding type, which has the following advantages: lack of weight, and a consequent lack of inertia, or flywheel effect, which is apt to prevent the quiet and quick shifting of the gears; ease of gripping; and an even distribution of the wear, which is taken up automatically. There is also no end-thrust with this type of clutch. A novel feature is the possibility of adjusting the distance of the pedal from the front seat to suit the length of the driver's leg. The transmission, which we illustrate, is a typical four-speed sliding gear of the selective type. Ball bearings are used throughout, and provision is made for oiling them from the gear case. As may be seen in the cut, there are two sets of sliding gears operated by two shifting forks. Two of the three bars shown operate these forks. The bars are locked by a transverse rod passing beneath them and through notches on their under surface. This locking rod (which is seen at the right-hand end) has a single notch which, when it is brought under any rod, frees it so that it can be moved back and forth by a vertical lever having a ball tip, which slips into the notch seen on the upper surface of each rod. The main shifting lever works in an H-shaped quadrant.



The side movement of this lever accomplishes the selecting of one of the three rods, while the forward and backward movement shifts one or the other set of gears forward or back, as the case may be. The advantages of this type of transmission are that the operator can always change from one gear to the other without passing through any idle gears. For instance, he can pass immediately from the low speed to the fourth speed without throwing any gears into mesh except those of the latter speed. While this is an advantage for a skilled operator, a straightforward movement is easier for the beginner, and, consequently, gears of the ordinary three-speed type are generally preferable. The Peerless bevel-gear drive is also shown. The differential is open, and two of the spur pinions can be seen through the casing. On each side of the differential are ball bearings and universal joints. The latter allow of a slight movement of the driving shafts, which extend through the tubular rear axle and drive the wheels through jaw clutches on the hubs. The wheels themselves revolve on adjustable ball bearings on the tubular axle. The universal joints mentioned make it possible to dish the wheels slightly, which adds somewhat to their strength. There is also no binding if the axle gets out of line. This rear-axle construction has always been a feature of the Peerless car. The wheel base of the new car is 107 inches, and the wheels are 34 inches in diameter. The two rear springs are connected by a transverse spring that supports the body in

the center, and makes a very easy-riding car. Besides the 30-horse-power car, a 45-horse-power model is also built.

HIGH-POWERED AMERICAN TOURING CARS.

(*Continued from page 32.*)

has a 104-inch wheel base, and weighs complete 2,300 pounds.

THE ROYAL 50-HORSE-POWER TOURING CAR.

The 1906 car put out by the Royal Company has practically the same chassis as the racer which made such a fine performance at the Vanderbilt cup race last October. The motor has a bore and stroke of 5 and 5½ inches, respectively. It is fitted with mechanically-operated valves on opposite sides, the cylinders being cast in pairs, and the valves being interchangeable. The bearings are bronze on the crankshaft and hardened steel at the wrist pins. They are all of sufficient surface not to require replacement more than once a year. The gears which drive the cam shaft are of fiber, uninclosed. The commutator is placed on top of the cylinders and is driven by bevel gears from the cam shaft. The centrifugal pump, which is also bevel-gear-driven and inclosed, can be seen in the view of the motor. The motor is fitted with a positive mechanical oiler which effectually lubricates all its parts. The ignition system consists of quadruple coils and storage batteries. It is of the usual jump-spark type. The radiator, of the cellular type, has a large belt-driven fan behind it. The Royal clutch is of the conical leather-faced type. It is of large diameter and has flat springs beneath the leather for the purpose of making it take hold easily. A universal joint is used between engine and transmission in addition to the usual two joints in the propeller shaft. The transmission, shown herewith, is of the sliding gear type, giving three speeds ahead and reverse with a forward and backward movement of one lever. The shafts are mounted on ball bearings and the gears are bolted to flanges made solid with the shafts, instead of being keyed or pinned. The gear case is suspended from the upper half by means of hangers, which makes it possible of removal without taking out the bolts which fasten it to the car, as by separating the two halves of the gear case, the bottom part carrying the gears can be immediately dropped. The intermediate reverse pinion is carried upon a short shaft in the upper part of the case, and when not in use is thrown out of mesh by a spring. The rear axle is of the live bevel-gear-driven type, the weight of the car being carried on the tubing which surrounds the driving axle. Roller bearings are used in the axle and wheels.

THE 50-HORSE-POWER HAYNES TOURING CAR.

Although one of the oldest automobile firms in America, the Haynes Company, of Kokomo, Ind., nevertheless obtained valuable experience in the past year with a racer built for the Vanderbilt race. This car made one of the steadiest-running performances of any in the race, and won fourth place. The 50-horse-power 1906 touring car is practically a duplicate of the racer, it having all the features which were tried out on the latter. Besides the peculiar roller bevel-gear drive employed on last year's cars, the new Haynes has an ingenious ratchet arrangement in the main driving gear of the transmission for the purpose of making it possible to jump back from high to intermediate or low speed when the car is running rapidly, without the danger of stripping the gears. This danger is a very grave one with all ordinary transmissions of the sliding type. By means of a ratchet in the main driving gear, this gear is allowed to run ahead of the driving shaft when the gears are changed from a higher to a lower speed, which ordinarily results in the car tending to drive the engine and consequently being brought up with a shock. So severe is the strain on the gears under these conditions that a 2,750-pound car carry-

How Much Can You Make $1 Earn?

Are you satisfied to let a bank grow wealthy by paying you only 3 or 4 per cent. for your money?

Have you ever thought how a bank makes interest by loaning your money at a higher rate than it pays you?

Have you ever wished you could get all the interest your money earns?

If you can

Save Only $1 a Month

we can show you where to invest it, with even better security than a bank affords, and where it will

Earn 7 Per Cent. at Once

and likely much more later.

The business is real estate.

It has been established 10 years.

It earned over 30 per cent. on its total capitalization last year.

If these brief facts interest you, write on a postal for our free book which tells about a remarkable opportunity for the safe investment of small amounts.

Do it to-day.

This advertisement may not appear again.

Atlantic City Estate Co.

VICTOR J. HUMBRECHT, President

1025 Drexel Bldg., - - Philadelphia

1906 THOMAS AUTO-BI

Model No. 44. Price $145

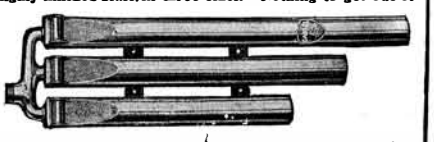
Three Horse Power. Simplest motorcycle on the market. Agents wanted everywhere. Catalog free.

THE THOMAS AUTO-BI CO.

1450 Niagara Street Buffalo, N. Y.

GABRIEL HORNS

Blow from exhaust, enabling the driver to give entire attention to the car, eliminating constant watching which mars the pleasure of an auto ride. Warn without frightening, having a clear, far sounding, musical blast.. Are made of highly finished brass, in three sizes. Nothing to get out of



order and are easily attached to any car, steam or gasoline

Have you heard our eight-tone horn? An octave on which you can play any tune. When purchasing be sure the horn has our trade mark. Write for catalog and prices.

GABRIEL HORN MFG. CO.

971 Hamilton St., Cleveland, Ohio

New York Representative, No. 148 W. 56th Street

Before you start—

Be sure you carry

a "B. & S." Auto Wrench. Drop-forged of the best steel throughout. Our General Service Wrench (below) is light, strong and handy.

THE BILLINGS & SPENCER COMPANY

Hartford, Conn.

A MODERN GASOLINE TRUCK

"Built for Business."

Made in Sizes 2 to 5 tons.

3-Ton Gasoline Truck.

4-Cylinder Vertical Engine

Two Sets Brakes

3-Speed Slide Gear Transmission

Double Chain Drive

THE AUTO CAR EQUIPMENT CO.

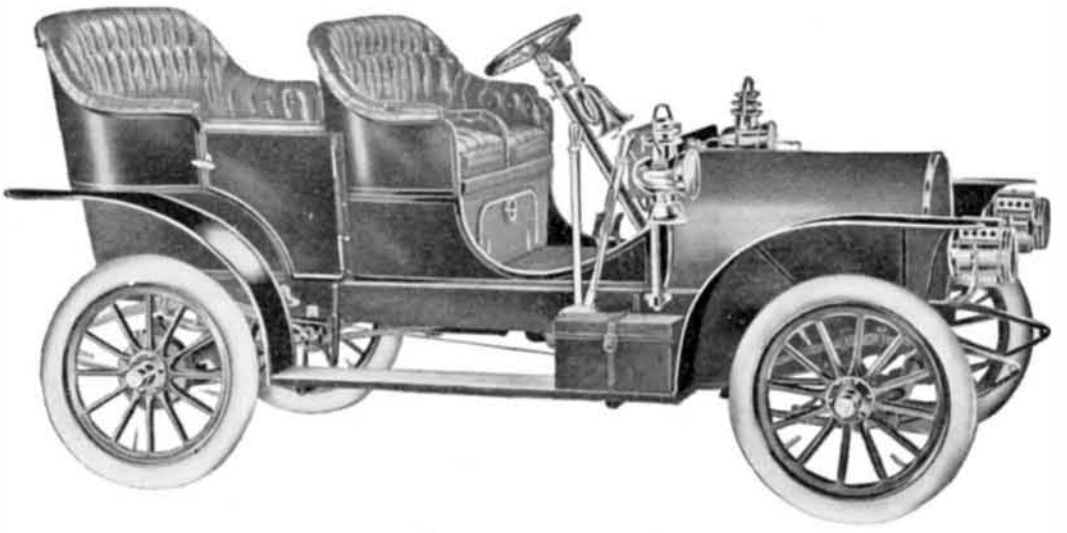
MANUFACTURERS OF

Motor Trucks, Omnibuses, Delivery Wagons and Sight-Seeing Cars, Gasoline and Electric.

OFFICE AND FACTORY

70-71 Edward St., Buffalo, N. Y.

FRANKLIN



Type G, four-cylinder light car; air-cooled, shaft-drive, sliding gear transmission, 3 speeds and reverse. New and perfect disc clutch; force-feed oiler on the dash; side doors; 88-inch wheel-base; 4 passengers; 35 miles an hour; 12 Franklin horse-power; 1,400 pounds. Full head and tail-light equipment. $1,800 f. o. b. Syracuse.

Why the astonishing fact that this light car, rated at 12 "Franklin horse-power," does more, on average roads, than any other car rated at 20 horse-power?

First: the real proportion of usable power is more than 12 to 20. Other cars are rated at the maximum horse-power of their engine, running *in the shop under ideal conditions.* Franklin cars are rated at the power they develop under the practical average speed *on the road at 20 miles an hour.*

Then: weight. Franklin air-cooling means a light engine and light construction throughout—no water or water-cooling apparatus; no heavy frame to carry them. At least 200 pounds saved on weight construction.

Then: little power lost between the engine and the rear wheels. The same engineering ability that designed and refined the marvelous motor has refined and saved power all over the car. Other cars lose enormous amounts of power in the clutch, transmission, joints in the shaft, bevel-gear, rear axle bearings—power is lost everywhere. In the Franklin this loss is trifling. This is a matter of fact and proof, and we have gone to the bottom of it.

Then: vibration. This is of enormous importance. It uses up power to shake a car, as it uses up power to shake your fist. A rough road reduces the power of the average car 50 per cent. or more, and a very rough road often stops the car altogether. The Franklin full elliptical spring suspension, with its flexible wood-sill, takes up the vibration, leaving the working parts free to do their work.

Not one reason but a dozen, all thought out and worked out with the same thoroughness and disregard of precedent which invented the Franklin four-cylinder air-cooled motor, when all the other American makers said that four cylinders were unnecessary and that air-cooling was impossible.

Send for the Franklin 1906 catalogue—by far the handsomest motor book ever made—which tells about

4-cylinder 12 h. p. Runabout, $1,400
4-cylinder 12 h. p. Light Car, $1,800
4-cylinder 20 h. p. Car, $2,800
6-cylinder 30 h. p. Car, $4,000

Prices f. o. b. Syracuse, N. Y.

H. H. FRANKLIN MFG. COMPANY, Syracuse, N. Y., *M. A. L. A. M.*

ing a normal load undergoes, when the gears are changed from high-speed (30 miles per hour) to intermediate (15 miles per hour) a shock to its mechanism equivalent to a vertical fall of 7 feet. The new construction does away with this shock completely and the life of the gears is greatly increased by it. Another feature of the new car is a solid inner live rear axle. This is fastened to one side of the differential and to the corresponding rear wheel, while the other side of the differential is attached to a sleeve slipped over the axle and driving the other rear wheel. Both axle and sleeve run in roller bearings of ample size. This type of bearing is also used on the ends of the engine crankshaft, and in the transmission. A new inclosed universal joint which transmits the power through the wide, flat surface of the forks is another feature of the car. The clutch is of the band brake type, having springs in the drum for the purpose of cushioning the latter when the band takes hold. The water pump is a very powerful one, and the motor, which has a 5⅛-inch bore by 6-inch stroke, has liberal water jackets. Special double piston rings are used with this motor. A mechanical oiler has leads to each cylinder and the crankcase.

THE LANE STEAM TOURING CAR.

A firm which has done much to promote the use of the steam vehicle in this country, and which still pins its faith to this type of machine, is the Lane Motor Vehicle Company, of Poughkeepsie, N. Y. The Lane car shown on page 33 embodies all that is best in steam vehicle construction, and is an up-to-date machine in every particular. The boiler, which is a combination flash and water-tube affair, is placed in front under the bonnet. The engine is located in an inclined position under the footboard, and the gasoline tank is under the front seat. A single chain from the engine crankshaft to the differential on the rear axle drives the car. The layout of chassis just described is one which was employed with success last year by two American constructors. It has been adopted by the Serpollet firm of France for this year. Thus, while France is said to lead the world in gasoline car construction, one of her leading steam-car makers has adopted an American design. The arrangement of the boiler in front takes away the heat from beneath the seats, and allows of much more space for carrying purposes. The engine is readily accessible by removing the floor boards, and the boiler by removing the bonnet. The claim is made for the Lane boiler that it has the economy of the regular flash-tube type, the reserve of the water-tube boiler, and a better draft than either. The burner is made entirely of tubing, and is said to be indestructible. The engine is completely incased and protected from dust. It is of the cross-compound type, with 3¼ and 5¼-inch cylinders and a stroke of 3½ inches. The steam chests are placed side by side between the cylinders, and they carry on their back surface the control device for running the engine simple or compound. This is operated by a pedal extending through the floor, and by means of it the engine may be made to exert two and one-half times its normal power. The engine is mounted in a frame of steel rods, suitably braced. The crankshaft, with its eccentrics, flywheels, sprocket disks, cranks, and counter-balances, is a single piece of hardened steel having its bearings ground. The crankshaft and wrist pins have roller bearings, and the eccentrics ball bearings. Both the air and water pumps are inside the oil-tight casing, and are directly actuated by the crosshead. Experience has shown the makers that the piston and valve rods carry sufficient oil into the interior of the engine to lubricate the cylinders properly. An oil cup for this purpose is placed on the dash, but it is only intended to be used occasionally when starting. The automatic by-pass for the water is operated by a thermostat, which depends upon the water level in the boiler. There is also a hand by-pass arranged on the steering post for use, if necessary. The air pressure on the fuel tank is maintained automatically by an air pump driven from the engine. The maximum pressure this pump can produce is determined by an adjustable clearance space, having a considerable range of adjustment from the outside. An independent steam air pump for emergency use and for tire inflation is also provided. The boiler is fitted with a fusible plug in case the water level falls within three inches of the bottom. This plug can be replaced without stopping the machine. The condenser, seen on the front of the car, is constructed of thin, flat, brass tubes, arranged vertically with their edges toward the front and air spaces between them. The steam enters a header at the top, and the water flows out at the bottom, and is returned to the tank by the back pressure. The top carries a coil for heating the feed water on its way to the boiler. The condenser is said to return practically all the water when the engine is running compound under normal conditions. The dash of this touring car is fitted with a considerable number of gages for indicating all that should be known by the operator when driving the car.

THE RAMBLER AUTOMOBILES.

Besides the regular runabout and touring car of the single-cylinder and double-opposed-cylinder type which have been regularly made by the Jeffery Company, this concern has brought out for 1906 a standard four-cylinder touring car with a three-speed sliding gear transmission, shaft drive, and all the usual features of this type. The engine consists of four individual cylinders having a 4-inch bore and 4½-inch stroke and rated at 20 to 25 horse-power. It has mechanically operated valves placed directly in the cylinder heads and opened by rocker arms on top of the cylinders. The rocker arms are made adjustable for the taking up of any wear; and the valves and cages may be removed readily for the purpose of grinding. The cam-shaft gears are inclosed in a dust and oil proof casing. The pistons of the Rambler engine are provided with six rings each, the rings being located in pairs with their joints at opposite points. Great care is taken in fitting the rings and pistons. The motor is fitted with a jump-spark ignition system, the source of energy being a six-volt, 60-ampere-hour storage battery. Individual Splitdorf coils are mounted on the dash. A safety device is fitted to the engine for the purpose of retarding the spark when the crank is released from the holding latch, in order to start the motor. The mechanical force-feed oiler is placed on the dash, with sight feeds in full view of the operator. A float-feed carbureter with an automatic air valve supplies the motor with the proper mixture. The throttle is controlled by a special wheel just under the steering wheel. This control is peculiar to the Rambler cars and is used in combination with an accelerator pedal. The spark advance is inter-connected with the wheel throttle control, so that the spark is advanced ordinarily as the throttle is opened. Under conditions where this is not desirable, however, the spark may be retarded and the accelerator opened to obtain full power. The clutch is interlocking with the gear-shift lever, so that it is impossible to change gears without first disengaging the clutch. The car has two sets of brakes, the regular brake being on the differential drum, and the emergency brake being of the expansive type placed within the rear wheels. This company also makes a larger four-cylinder car having a 5 x 5½-inch motor of 35 to 40 horsepower and fitted with a countershaft and chain drive to the rear wheels instead of the bevel-gear drive used on the lighter model. The larger car is a trifle longer than the others and is provided with 34-inch wheels and 4-inch tires. A Limousine model is also one of the products of the Rambler factory, which is this year

The "Maxwell"

Perfectly Simple Simply Perfect

ESTABLISHED IN A SEASON

FOURTEEN long years of study, experiment and motor car experience. One short year of triumphant **proof.**

That is the story of the "Maxwell" automobile. The **"Maxwell Doctrine"** stands behind it, a doctrine that is not theory but is based on a constructive principle that Mr. Maxwell has tested in every clause and found true. The designer and builders of the "Maxwell" believe in this "doctrine." Through every experience they have **adhered** to it. In the face of much criticism they have **proved** it to the satisfaction of the public. The **greatest** number of cars ever sold by any manufacturer in an initial year and the enthusiastic approval of the thousands of owners and their friends is the **proof.**

If **you** have doubts as to the practical value of a two-cylinder car, where not over 16-20 H. P. is required, ask a **"Maxwell"** owner what **he** thinks of it. That is the keynote of our doctrine. If you are interested in advanced motor construction, it will pay you to get the facts about the "Maxwell." Most of them you can get from our catalogue which will be sent on request, but **all** of them can be obtained from a talk with a Maxwell agent and a ride in a Maxwell car.

16-20 H. P. Touring Car $1,450 **10 H. P. Tourabout $780**

MAXWELL-BRISCOE MOTOR CO.

TARRYTOWN, N. Y.

BRANCHES

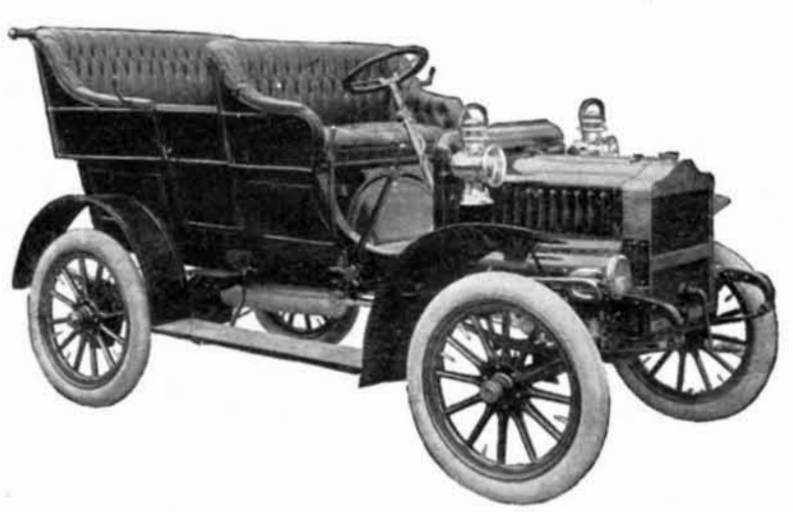
MAXWELL-BRISCOE, INC.
317 W. 59th St., New York City

MORRISON TYLER MOTOR CO.
221 Massachusetts Ave., Boston, Mass.

MAXWELL-BRISCOE-CHASE CO.
1502 Michigan Ave., Chicago, Ill.

MAXWELL-BRISCOE-MCLEOD CO.
243 Jefferson Ave., Detroit, Mich.

FISHER AUTOMOBILE CO.
330 North Illinois Ave., Indianapolis, Ind.



turning out one of the most complete lines of cars of any factory in the country.

THE COLUMBIA 40-45-HORSE-POWER TOURING CAR.

The new Columbia heavy touring car is much the same as the 1905 model, though the new "Mercedes" type bonnet and several changes in the body have changed its general appearance. The motor is made up of two pairs of 5 x 5 cylinders. It develops its rated power at 800 R. P. M., but it has a range of from 150 to 1,500 R. P. M. under throttle control. The mechanically-operated valves are in a chamber on one side of the cylinders. The inlet valves are directly above the exhaust valves, and are opened downward by vertical pull rods having arms on their top extending over the valve stems. A cam-operated lever within the crank-case draws each rod downward and opens the inlet valve. The breech-lock scheme of fastening the spark plugs in place is retained. The ignition is by jump spark with quad coil on the dash and storage batteries as a current source. The crankshaft is made from a solid slab of steel. The car has a 3-speed sliding-gear transmission and chain drive to the rear wheels. Roller bearings are used in the wheels. Both brakes are interconnected with the clutch, which is of the leather-lined cone type in the flywheel.

All the Columbia cars are fitted with a new automatic governor having no needle valve or gasoline-feed adjustment. The auxiliary air is let in by a sliding piston, which uncovers ports in the bottom of the carbureter. The governor operates a by-pass valve and not the throttle. The latter is connected to a pedal. The new 24-28 horse-power four-cylinder light car has low-tension magneto ignition besides several other improvements. The E. V. Company also manufactures the same 18 horse-power double-opposed-cylinder car that it marketed last year. In electric vehicles, a brougham with cross seat in front for driver is one of the new models.

THE GROUT GASOLINE TOURING CAR.

The Grout Brothers Automobile Company, Orange, Mass., has once more turned its attention from the steam to the gasoline car, and a new, large touring car (shown on page 33) of 30 to 35 horse-power is the result. This machine is of the standard four-cylinder type, having individual, integrally-cast cylinders, with mechanically-operated valves placed on one side and driven from a single camshaft. The valves, as is usual with most modern cars, are all interchangeable. The ignition system, of the jump-spark type, is carried out with the use of a single coil and a new pattern of high-tension distributor which allows of the use of rigid wires. An improvement is also to be noted in the spark advance mechanism. Instead of moving the box itself, the revolving wiper is made to advance on its shaft. The motor and transmission are oiled by a novel force-feed lubricator, having a single pump and a distributing valve, which sends the oil through the various pipes. The transmission is of the usual three-speed type with direct drive on the high speed. The countershaft at the rear of the gear box runs on roller bearings, and has a band brake operated by a pedal. A double chain drive to the wheels is employed. The main frame of the Grout car is of armored wood, strengthened at the corners by steel braces. The power plant is mounted on a sub-frame of channel steel. Ball bearings are used in the wheels, which are shod with 32 x 4-inch tires having non-skid treads. The car is controlled from the steering wheel, the ignition and throttle levers being mounted on segments, which remain stationary when the wheel is turned.

THE AMERICAN MERCEDES AUTOMOBILE.

The product of the Daimler Manufacturing Company, illustrated on page 33, is said to be an exact duplicate of the world-famed machine made by the Daimler Motoren-Gesellschaft. The American

The Rapid Motor Commercial Vehicles

Our entire organization has from the very first been devoted exclusively to the building of Commercial Vehicles.

The success of "Rapid" motor wagons is due to the fact that they are built with the idea of giving heavy, continuous service, and carrying heavy loads.

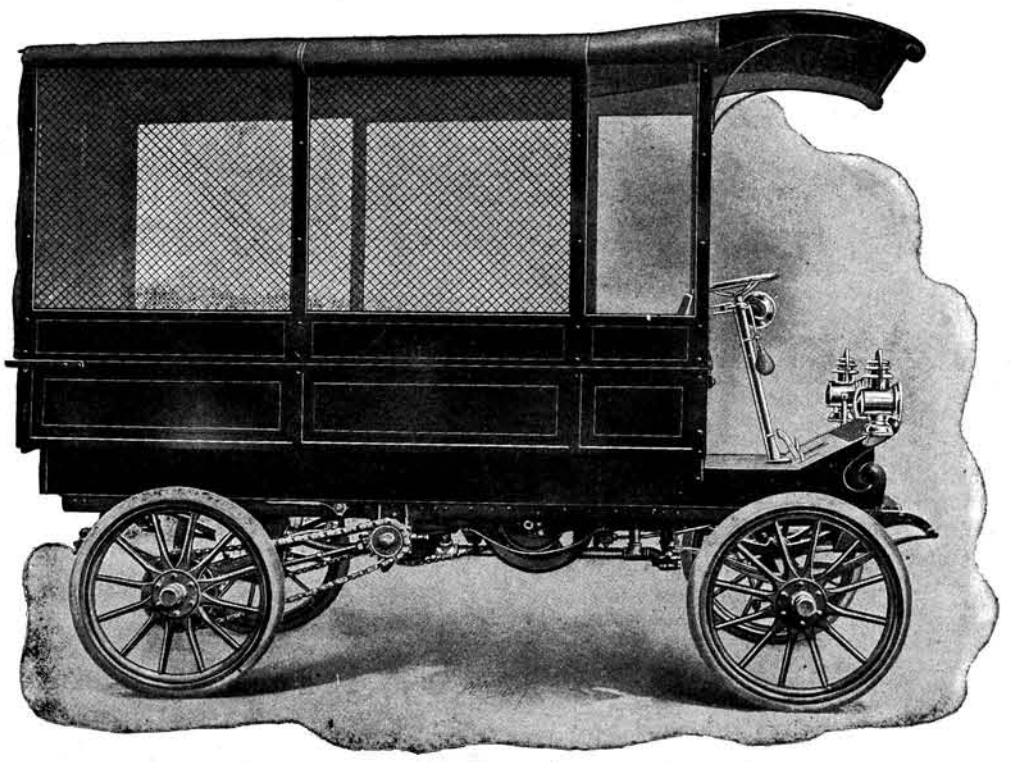
The wagon illustrated weighs 2230 lbs. and carries 3000 lbs. easily. Rear wheel measures 34 inches; front wheel 32 inches; solid tires. The double side chain drive insures a maximum of power delivered to the 2-inch solid steel axles. The cut illustrates only one of our many bodies. Size and style of body furnished to meet your requirements. Price, 1 ton, $1400; 1½ ton, $1800. **Guaranteed for one year.**

Agents can secure territory by writing me now, before all choice allotments are gone. Our new factory is a guarantee of prompt delivery.

For full information, Address
G. S. HENRY, Sales Manager

RAPID MOTOR VEHICLE CO.
PONTIAC, MICH.

See our exhibit at the New York and Chicago Automobile Shows.



Running Gears

CHAIN AND BEVEL

For Commercial or Pleasure

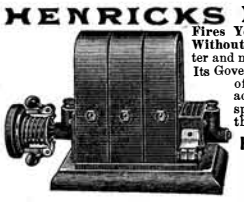
Axles, Wheels, Bodies of all designs, Engines, Transmissions, and every modern requisite for Automobiles. We are the ONLY house in America where you can get to order everything for an Automobile, and that of any kind. We build the most because we build the best.

NEUSTADT AUTO SUPPLY COMPANY
St. Louis, Mo.

BEMIS & CALL ADJUSTABLE S NUT WRENCHES

Just the tool to handle those nuts in the cramped places on automobiles. Made in five sizes. Send for circular.
BEMIS & CALL HARDWARE & TOOL CO., SPRINGFIELD, MASS.

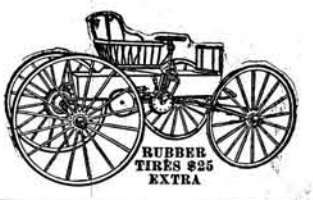
HENRICKS MAGNETO



Fires Your Gas or Gasoline Engine Without the aid of batteries. It is better and more durable than any Dynamo. Its Governor regulates the speed regardless of speed of flywheel. Its Governor adjusts to imperfect flywheels. The spark does not burn the contacts of the engine. Fully guaranteed.

HENRICKS NOVELTY CO.
131 S. Capital Ave.
Indianapolis, Ind.

A PRACTICAL AUTOMOBILE ONLY $250.00



Not an experiment but a thoroughly practical automobile built upon the buggy principle. Invented by an engineer with ten years' experience in automobile construction. A light, strong, steel-tired Automobile Runabout with a 2-horse power gasoline motor. Runs 100 miles on one gallon of gasoline. Speed from 4 to 18 miles per hour and is easy to steer and handle. Travels over any kind of road and is a good hill climber. No complicated parts to get out of order. The **"SUCCESS"** is absolutely **safe** and **durable.** It is what thousands have long been waiting for—a practical automobile at a price within the reach of any one who keeps a horse and buggy. It occupies a distinctive place in the automobile world. Investigate its merits—it will pay you. Write today for descriptive literature, terms, etc. Address

"Success" Automobile Mfg. Co., 532 De Ballviere Ave., St. Louis, Mo.

Fire Protection

This illustrates a section of a factory building at Gloversville, N. Y., equipped with the

Covert Fire Escape

No other Fire Escape will give the same facilities for quickly vacating a burning building.

It is the simplest and most economical permanent Fire Escape now on the market.

Send for circulars and full particulars.

COVERT FIRE ESCAPE CO.,
Troy, N. Y.

company has acquired the complete specifications of the German machine, and in some instances has imported parts from Germany. The materials used in the construction of the American Mercedes are required to pass the same rigid tests used abroad. The steels used in the axles, crankshafts, gears, and gearshafts are made from a special alloy said to have a tensile strength nearly double that of the best axle and shaft steels obtainable here. Thus, it will be seen that as far as material is concerned, the American car should be equal to its more celebrated brother. The motor is a four-cylinder engine having its cylinders in pairs and the valves placed symmetrically. All the valves are operated mechanically, and mechanical make-and-break igniters are also employed in connection with a Simms-Bosch magneto. Sight-feed oilers located on the dash and fed by pressure are used for lubricating. There is also an auxiliary hand oil pump. The transmission is of the latest Mercedes type, in which there are two bevel gears on the differential. One of these is driven from the secondary shaft of the transmission, while the other is used only on the high speed when a direct through drive is maintained. Chain drive to the rear wheels is employed, and Brampton self-hardening steel chains are used. The car has two separate pedal brakes working on the transmission, as well as expanding brakes in the hubs of the rear wheels. The engine develops 45 horse-power at 1,000 R. P. M. The cylinders are 120 by 150 millimeters. The valves are twice as large as those used last year, and the metal expanding clutch is inclosed and runs in oil. The engine crankshaft is mounted in non-adjustable ball bearings of the type shown on page 34.

THE RAPID MOTOR VEHICLE COMPANY'S TRUCK.

The truck shown on page 33 is fitted with a double-opposed-cylinder motor placed fore and aft of the vehicle beneath the driver's seat. This engine has a 5-inch bore and stroke, and is rated at from 16 to 18 horse-power. It is connected direct to a planetary gear transmission, giving two speeds forward and reverse, and which is mounted at its outer end in a special form of bearing, which can adjust itself to any mis-alinement caused by strains upon the frame. A chain from the engine crankshaft runs back to a countershaft just forward of the rear springs, and the wheels are driven by individual chains from this countershaft. Roller bearings are used throughout, and the car is mounted on exceedingly heavy springs, of which there are a considerable number. Transverse springs are used at front and rear, besides a supplementary transverse spring over the rear axle. This latter spring only comes into play when the car is heavily loaded. The body of the truck is very strongly constructed, and is heavily ironed throughout. The motor is lubricated by a mechanical oiler of novel design, which has but one plunger that forces the oil through a series of holes at every stroke. The commutator is placed in a very accessible position at the side of the car. The construction throughout is of the simplest and most substantial sort. A multiple-disk clutch is used for the high speed, and it is claimed that the car can be started on an incline when fully loaded by simply throwing in this clutch. The machine shown is intended for a load of a ton and a half, but it will carry heavier loads if necessary.

OLDSMOBILE BUS.

The bus shown on page 33 is a 20-passenger rig, mounted on the largest commercial vehicle chassis that the Olds Motor Works produce. This chassis is fitted with a vertical 2-cylinder engine located under the driver's seat, and having a planetary gear arranged on its crankshaft. A Morse silent chain runs back from this shaft to a countershaft in front of the rear springs, and an individual chain from this countershaft drives each rear wheel. The machine is fitted with

THE INCOMPARABLE

WHITE

THE CAR FOR SERVICE

WHITE CATALOG

Every one interested in automobiles, whether steam, gasolene or electric, should write to us for the new catalog of the Model "F" White steam car. It contains, first of all, a brief historical sketch, tracing the gradual perfection of the steam engine by the labors of many generations of engineers. Then is related how Rollin H. White, by the invention of an entirely new system of steam generation, whereby the boiler was eliminated, devised the first successful steam machine. This car was first offered to the public in 1901.

Brief references are made throughout the catalog to the success of this first model and to the constan. victories and notable achievements which every model of the White steamer has each year placed to its credit. There is also included a concise and lucid description of the White system. Finally, there are shown the various Model "F" cars—touring cars, Limousines, landaulets, victorias, runabouts, extension landaulets—which we are now delivering.

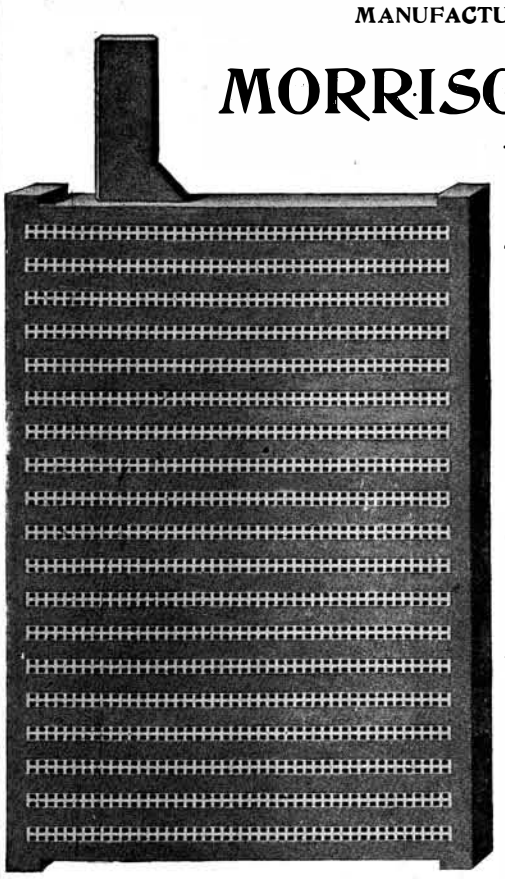
A POSTAL CARD TO US BRINGS THE CATALOG BY RETURN MAIL

WHITE SEWING MACHINE COMPANY, CLEVELAND OHIO

Universal Electric Storage Battery Co.

MANUFACTURERS OF THE

MORRISON BATTERY



We can save you space and weight in your battery installations.

The Morrison type of plate with its metallic surface and completely enclosed active material insures

LONGEST LIFE,
GREATEST MILEAGE,
LEAST MAINTENANCE
IN AUTOMOBILE WORK.

COMPLETE LINE OF
ELECTRIC VEHICLE
& SPARKING BATTERIES

ALSO
BATTERIES FOR
CENTRAL STATIONS,
RAILWAY LIGHTING,
TELEPHONE AND
SIGNAL WORK.

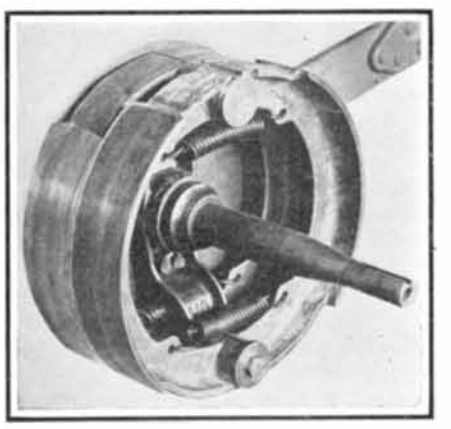
Sales Office: 1355 Railway Exchange Building
Factory: 36-38 Union Park Place

CHICAGO, ILLINOIS

roller bearings throughout. The wheels are large, and are shod with solid rubber tires. A speed of 15 to 18 miles an hour is obtainable on the high gear, and this machine will be found very serviceable for carrying on a bus business where the roads are fairly good.

THE NATIONAL SIX-CYLINDER TOURING CAR.

Without a doubt one of the largest and finest American machines is the new six-cylinder National. This car has a 4½ x 5-inch engine, having individual cylinders and mechanically-operated valves in a single valve chamber on each cylinder. These valves are worked by a single camshaft. The crankshaft of the engine is supported in five large bearings, and the crankcase is divided into four compartments. It is also provided with handholes of large size, so that the crankshaft bearings can be readily inspected. Jump-spark ignition with individual vibrating coils and a dynamo, storage and dry batteries as sources of current supply are used. The dynamo is placed on end just back of the dash, so that its bevel friction pulley runs against the side of the motor flywheel. The commutator can be readily reached by removing a cap. A positive mechanical oiler is used for lubricating the engine. The water-circulating pump is driven from the camshaft, and is readily removable without disturbing any parts of the engine. The same type of clutch having flat springs beneath the leather is used. The clutch is interlocked with the brake and gear levers. The propeller shaft and the transmission shafts are mounted on non-adjustable ball bearings. A feature of the National car that is noteworthy is the employment of two tie-rods between the steering knuckles of the front wheels. The hub of each rear wheel is fitted with two internal expanding brakes, as shown in the accompanying cut. This is a new feature found on but few of the 1906 cars. One of these brakes is operated by a pedal, and the other by the emergency lever. The steering gear is of the worm type, and is non-reversible. The body used on the car is of cast aluminium. It is very commodious, and has a capacity of seven passengers, all facing forward. The control of this car when running on the high speed is so complete that it can be speeded from 3 to 60 miles an hour simply by opening the throttle. A four-cylinder National car holds the record of 1,094 3-16 miles in twenty-four hours. This means an average speed, while the car was running, of 51.9 miles per hour. The record was made upon the track at Indianapolis on November 4 last, and it was an excellent demonstration of smoothness and steadiness of running. Two cars made the attempt on the previous record, but one was driven through the fence by accident at night. The other car continued in its race against time, and succeeded in beating the previous record by 78 9-16 miles. It also broke the 150-mile record, and all the other world's records from 650 to 1,050 miles. A test of this kind is one of the most severe that can be given a car, and one which approximates rather closely to what it will have to do when driven at high speeds over good roads.



TWIN EXPANDING HUB BRAKES.

THE STODDARD-DAYTON TOURING CAR.

An excellent example of a modern 4-cylinder touring car is that made by the

The Morgan & Wright Automobile Tires.

A firm that has done much toward bringing the automobile tire to its present improved state is the Morgan & Wright Company, of Chicago. This company was well known for its bicycle tires some years ago, and it has consistently maintained its reputation by the manufacture of first-class tires. The 1906 line manufactured by this firm is said to have several distinct improvements as follows: In the first place, an increase in fabric strength of something like 40 per cent over the fabric ordinarily used has been obtained by a special method of manufacture. Furthermore, the fabric is so laid down in constructing the tire that the latter, when finished, has the precise shape that it would naturally have when inflated, and consequently there is no undue strain of the fabric set up when inflation takes place. Another advantage found in the Morgan & Wright tires is that not only the tread but the whole tire is wrapped throughout in its construction. The "wrapping" process, which is rather of a mystery to the layman, is the process of laying in place by hand several layers of fabric, in order to insure a correct placing of said layers. In this way they obtain the position which they were to assume naturally, and they are not subjected to undue strains of stretching. This process is generally used on the tread only, but with the Morgan & Wright tire it is used throughout. The fourth improvement is the employing of a very tough grade of specially compounded stock for the tread of the tire. The balance of the tire is made of the highest grade Para rubber, which gives the tire great resiliency. These tires are made in several styles, including the Clincher rim, the Dunlop rim, and with the Baily "Won't Slip" tread. This tread consists of a series of disk-like raised places on the tread of the tire, which keep it from slipping under the most adverse conditions, and also aid in preventing punctures. The Dunlop tires are made of the very best materials. The rings which secure the tire to the rim are of imported piano wire. The great care which is used in the construction of the tires will be apparent when it is stated that the makers keep an expert constantly on duty at the mill which supplies them with the fabric, for the sole purpose of inspecting the raw material and rejecting any which shows the slightest impurity. The record of these tires for resiliency and durability is of the highest, and the reason for this is readily seen in the care which is taken in their construction.

HIGH-POWERED AMERICAN TOURING CARS.

(*Continued from page 54.*)

Dayton Motor Car Company, and known as the Stoddard-Dayton. This machine is a high-class car in every respect. It is fitted with a 4½ x 5 Rutenber motor having interchangeable, mechanically-operated valves, all on one side. The inlet and exhaust pipes may be detached readily by removing four nuts. The connecting rods are adjustable at both ends. A mechanical pressure-feed oiler operated by an eccentric lubricates the engine. This is controlled by spark and throttle levers on the steering column. The brake pedal, when pushed, also throws out the clutch, and both pedals are connected so as to close the throttle and prevent the engine from racing. The transmission gives three speeds and a reverse. It is of the selective type and is controlled by a single lever working in an H-shaped quadrant. A double universal joint is fitted between its forward end and the clutch, which is of the standard cone type with ball thrust bearing. The rear axle is of the usual live floating type employed almost universally nowadays with a bevel-gear drive, the wheels turning on roller bearings on the ends of the incasing tube and being driven by the inner live axle through jaw clutches in the hubs. Expanding-ring brakes lined with camel's hair are fitted in the wheels, and a transmission brake operated by a pedal is also provided. The car has a 103-inch wheelbase, and 32 x 4-inch tires.

MORGAN & WRIGHT TIRES ARE GOOD TIRES

These Tires Have Commanded Popular Favor Through Sheer Force of Merit

CLINCHER

BAILEY TREAD

DUNLOP

MORGAN & WRIGHT TIRES

have proven conclusively to automobilists that tire troubles are an unnecessary bugbear.

They have proven this by successfully meeting every demand put upon tires of this character.

Mere claims to superiority have had comparatively little to do in popularizing them among automobilists.

It has been the man-to-man, user-to-user testimony that has caused them to be known as **exceptionally serviceable tires.**

They have met the **automobilist's** idea of what a really good tire should be, by giving a full dollar's worth of service for every dollar of cost.

They have made hosts of friends because they have **made good.**

The 1906 tires illustrated above are a distinct advance in both scientific and practical tire construction over anything that has been offered to automobilists heretofore.

We honestly believe that tire-users everywhere can well afford to give unbiased consideration to their merits before specifying 1906 tire-equipment.

Ask for copy of "Making Good" brochure.

MORGAN & WRIGHT, CHICAGO

NEW YORK,	214 W. 47th Street	DETROIT,	265 Jefferson Avenue
SYRACUSE,	214 S. Clinton Street	ATLANTA,	34 Edgewood Avenue
PHILADELPHIA,	Broad and Vine Sts.	ST. LOUIS,	538 N. Vandeventer Ave.
BOSTON,	228 Columbus Ave.	DENVER,	1562 Broadway
CLEVELAND,	347 Huron Street	LOS ANGELES,	940 S. Main Street
DAYTON,	417 E. 5th Street	SAN FRANCISCO,	1067 Mission Street
MINNEAPOLIS,	708 Hennepin Ave.	PORTLAND,	86 6th Street

AUTO-CAR EQUIPMENT COMPANY'S COMMERCIAL VEHICLES.

This concern makes a specialty of vehicles for commercial purposes, such as passenger omnibuses, delivery wagons, trucks, and sight-seeing automobiles. One of the new models on exhibition at the Armory Show is a 12-passenger wagonette, fitted with a double-opposed motor of 18 horse-power, mounted crosswise beneath the body. This motor is in an accessible position and is fitted with a planetary transmission, giving two speeds ahead and a reverse. It drives, through an inclosed bevel gear running in oil, the countershaft from the ends of which chains extend to the rear wheels. The machine is very compact and neat in appearance. Its length over all is 9½ feet. It is fitted with movable sashes, which can be taken out in the summer, and which thus make it a practically open vehicle.

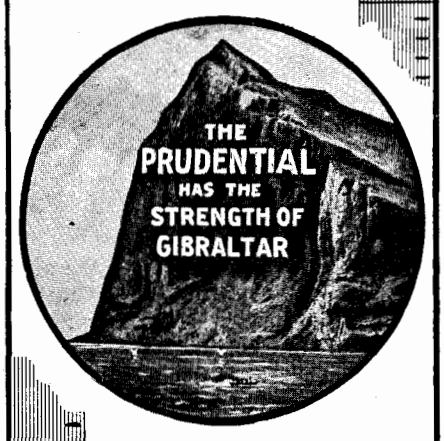
Another machine turned out by this firm has a handsome closed body designed to carry fourteen people, while two more may be carried on the driver's seat. The body is mounted on the running gear by a three-point suspension. The car is fitted with large 36-inch wheels having 3½ and 4-inch endless solid rubber tires in front and rear. Roller bearings are used in the wheels, which also have integral brake drum and sprockets attached. The car is driven by a four-cylinder vertical motor placed in front. This engine is said to develop 34 B.H.P. at 1,000 R. P. M. Its valves are all mechanically-operated and located in the cylinder heads. The motor is connected to a two-speed transmission, the gears of which are of wide face and heavy pitch. The machine has a wheel base of 120 inches, and its length over all is 13½ feet. It is proposed to have one of these cars running between the Garden and the Sixty-ninth Regiment Armory during the show week. An electric hotel bus somewhat similar in design is another of the models manufactured by this concern. The company also makes a 3-ton gasoline truck, having the same power plant as the 16-passenger wagonette. This truck will travel 10 miles an hour at high speed. It is fitted with a stationary or removable top, as the purchaser may desire. A novel feature of this truck is sand boxes and valves for sanding the road in front of the rear wheels, should this be found necessary.

THE 1906 WHITE STEAM MACHINES.

The new White steam car has a very much lengthened wheel base and a roomy side-entrance tonneau body. The power plant is practically identical with that used last year, the compound two-cylinder vertical engine being placed in front under the bonnet, and the flash generator being situated under the forward seat. The car is fitted with bevel-gear drive and disconnecting clutch, for the purpose of allowing the engine to run idle for a few moments at the start. In connection with this clutch a secondary gear is provided, by which the car can be run at half speed when the engine is making its full number of revolutions. This lower gear can be used whenever the road conditions necessitate slow traveling and increased power. Ball bearings are used in the engine, transmission, rear axle, and wheels. The engine is lubricated by a belt-driven oiler located on the dash. The crankcase is filled with oil, and the splash from the cranks is relied on for oiling crankshaft bearings. The low speed, bevel, and differential gears all run in oil. This thorough lubrication of all wearing parts is a point which has received special attention with the new models. The engine of the 1906 car is rated at 18 horse-power. There are several forms of closed bodies constructed by this company, any one of which can be used upon the standard chassis. This chassis consists of an armored wood

WHICH WAY

Runs the Age-measure of Your Life; up or down? Are you climbing to middle-life or slipping down life's slope toward old age? In either case you are growing older each day. Every day provision for your family becomes more necessary, because every day reduces the unknown quantity of opportunity by twenty-four hours.



"Procrastination is the thief of time." It is also the thief of money, justice and family happiness when it leads a man to put off insuring his life until it is too late.

Make the future safe for yourself and your family by a Life Insurance policy in

THE PRUDENTIAL

INSURANCE COMPANY OF AMERICA

Incorporated as a Stock Company by the State of New Jersey

JOHN F. DRYDEN, President

Home Office: NEWARK, N. J.

Write for Rates at Your Age. Dept. 121

frame 13 feet 5 inches in length, and carrying at its front end the motor, which is directly connected to the rear axle by a universally-jointed propeller shaft. Two powerful brakes are provided; one, a foot-brake, acts upon the flywheel by means of expanding shoes, while the other, the hand brake, is connected with expanding shoes within the hub drums of the rear wheels. The wheel base of this chassis is 9½ feet. It is fitted with 34-inch wheels having 4-inch tires, and the weight of the complete touring car is 2,275 pounds.

THE DECAUVILLE MODELS FOR 1906.

In the Decauville exhibit at the Madison Square Garden Show will be found representatives of the five models constructed for 1906. All are built upon the patented frame, in which a steel pan stamped integrally with the side bars of the frame supports the engine and gear case. The engine has four vertical cylinders cast integrally in pairs, with valve chambers on opposite sides. It is automatically oiled through a sight-feed lubricator, and is fitted with high-tension ignition by means of a magneto or batteries. The carbureter is of the automatic type controlled by the speed of the engine. Gasoline is supplied by pressure from the gasoline tank. A honeycomb radiator fitted with a fan, and having its water circulated by means of a positively-driven gear pump, is used on all the cars. All of the driving gears are inclosed and run in oil. The five different sizes of cars are fitted with 12-16, 16-20, 26-28, 30-35, 45-60 horse-power engines. The two larger cars are fitted with side-chain drive, while the three smaller ones have shaft drive. The lowest-powered car is capable of a speed of from 30 to 35 miles an hour, while the 60-horse-power machine will travel from 50 to 60 miles an hour. The Decauville Company's exhibit of foreign cars is one of the most complete at either show.

THE NEW DARRACQ LIGHT TOURING CAR.

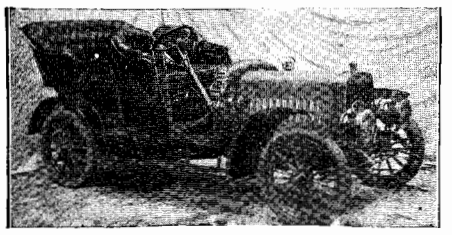
In view of the fact that the Darracq machine won the Vanderbilt cup, and that an extremely high-powered racer has been built recently with a view to capturing the two-mile-a-minute trophy at Ormond, a brief description of the light Darracq touring car, marketed in this country by the American Darracq Co., will no doubt be of interest. A 20-32 horse-power model has a four-cylinder vertical engine of 112 millimeters bore by 120 millimeters stroke, the cylinders being cast in pairs. The engine drives a three-speed sliding gear transmission, which is in turn connected through the usual universally-jointed propeller shaft and bevel-gear drive to the live rear axle. The three forward speeds and one reverse are obtained with a single lever. The clutch used in the engine flywheel is a leather-faced cone, having four springs beneath the face to allow of easy engagement. The clutch pedal is connected with the throttle in such a way as to close this when the clutch is disengaged. The throttle lever is located on a stationary sector in the steering wheel. The car is fitted with internal expanding brakes on the propeller shaft and rear wheels. The engine is lubricated by splash, the level in the crankcase being maintained by a small paddle pump, driven off the camshaft, and which sends oil through sight feeds on the dash to the crankcase. Either high-tension ignition by coils and accumulators, or low-tension magneto ignition is used. The wheel base of the machine is 120 inches. It is fitted with 880 x 120-millimeter tires in the front and rear; and the speed it is capable of making is in the neighborhood of 50 miles an hour.

THE FOUR-WHEEL DRIVE TRUCKS.

In our Automobile Number last year we illustrated a new form of gasoline truck, in which all four wheels were driven from suitable countershafts connected with a three-speed transmission. The Four-Wheel Drive Company, of Milwaukee, Wis., have improved this truck, and have now brought out a model in

Berkshire Automobiles

HIGH CLASS TOURING CARS
MADE AND TESTED IN THE BERKSHIRE HILLS



THREE MODELS
16 H. P. $2,000 25 H. P. $2,500 40 H. P. $4,500

The car that will do in the Berkshire Hills will do anywhere on this earth

Berkshire Cars are a modern, up-to-date American product.

No Agents. Entire output handled direct by

DOUGLAS ANDREWS COMPANY, Selling Agents
1623 Broadway, NEW YORK
Branch Stores: CHICAGO, BOSTON, BROOKLINE, PITTSFIELD

5th And then the justice full of wise saws.

For Shakespeare's Seven Ages

Horlick's Malted Milk is used in thousands of homes as an invigorating and healthful table drink. More wholesome than tea, coffee or cocoa. An ideal nutrient for the infant, the growing child, and the aged. A refreshing and nutritious luncheon for every member of the family. Prepared by simply stirring in water.

Pure, rich milk, from our sanitary dairies, with the extract of choice malted cereals, elaborated to powder form. Also in Lunch Tablet form, chocolate flavor. A healthful confection for children, and a palatable quick lunch for professional and business men. At all druggists.

Sample, vest pocket lunch case, also booklet, giving valuable recipes, sent free if mentioned.

Ask for HORLICK'S; others are imitations.

Horlick's Malted Milk Co.
Racine, Wis., U. S. A.
London, England. Montreal. Canada.

Leave Winter Behind You

Take a Trip to the Tropics

On one of the perfectly equipped "Admirals," the Twin Screw U. S. Mail Steamships of the

United Fruit Company

They afford the most delightful salt water trip of the winter months. Within 24 hours after leaving, you are in the warm airs of the Gulf Stream. Hotel accommodations in Jamaica satisfy every desire.

Weekly Sailings from Boston and Philadelphia. Steamships "Brookline" and "Barnstable" weekly from Baltimore.

Round Trip, $75 and $45
One Way, $40 and $25

Rates Include Meals and Stateroom Berth

"A Happy Month in Jamaica" is a fascinating booklet we send on request. For this and complete information, write to one of these addresses.

DIVISION PASSENGER AGENT
UNITED FRUIT CO.
Long Wharf, Boston
5 N. Wharves, Philadelphia
104 East Pratt Street, Baltimore
321 St. Charles Street, New Orleans, or
Raymond & Whitcomb Co.
Thos. Cook & Sons
or local Tourist Agents

"FOLLOW THE FLAG"

There is nothing more assuring to the traveler than his knowledge of the fact that he is traveling on a firm roadbed upon which is laid the heaviest of steel rails, made true in all their curves, and that the train which carries him is of the highest standard of excellence known to railroads and is being guided to its destination by experienced minds. These are the conditions which become apparent to the frequent traveler on the Wabash Line and which have made that line justly famous.

The aggressive management, at all times alert to the needs of the public, carry passengers in through cars between

ST. LOUIS and CHICAGO

Kansas City, Omaha, Toledo, Detroit, Niagara Falls, Buffalo, New York, Boston, St. Paul and Minneapolis

AND BETWEEN

Chicago and Pittsburg, Buffalo, New York and Boston

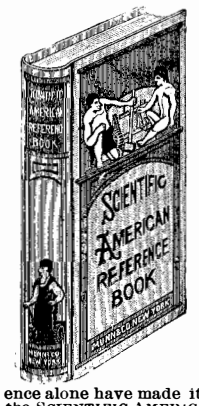
C. S. CRANE, G. P. & T. A., St. Louis, Mo.

Valuable Books

JUST PUBLISHED

Scientific American Reference Book

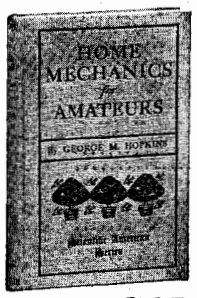
12mo. 516 Pages. Illustrated. 6 Colored Plates. Price $1.50, postpaid



The result of the queries of three generations of readers and correspondents is crystallized in this book, which has been in course of preparation for months. It is indispensable to every family and business man. It deals with matters of interest to everybody. The book contains 50,000 facts, and is much more complete and more exhaustive than anything of the kind which has ever been attempted. The "Scientific American Reference Book" has been compiled after gauging the known wants of thousands. It has been revised by eminent statisticians. Information has been drawn from over one ton of Government reports alone. It is a book of everyday reference—more useful than an encyclopedia, because you will find what you want in an instant in a more condensed form. Sixty years of experience alone have made it possible for the publishers of the SCIENTIFIC AMERICAN to present to the purchasers of this book a remarkable aggregation of information.

Home Mechanics for Amateurs

This book has achieved an unparalleled success in one week, and a Special Edition of 4,000 copies has been ordered. It is by far the largest and best book on the subject ever offered at such a low price. It tells how to make things the right way—the "only" way—at small expense. It will prove of value to you—much more than you realize. Do things with your hands. Send for a circular giving contents—the circulars cost only a cent—the book $1.50 postpaid. If the book could meet you face to face you would be the first to purchase. The first large edition is almost gone, order to-day.



370 Pages 326 Engravings Price $1.50

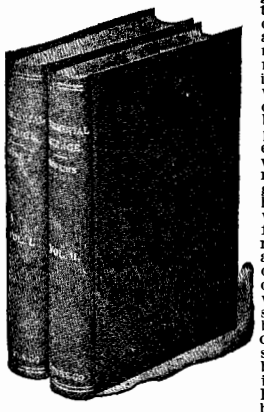
TWENTY-THIRD EDITION

EXPERIMENTAL SCIENCE.

By GEORGE M. HOPKINS

Revised and Greatly Enlarged. 2 *Octavo Volumes.* 1,100 *Pages.* 900 *Illustrations. Cloth Bound, Postpaid,* $5.00. *Half Morocco, Postpaid,* $7.00.

EXPERIMENTAL SCIENCE is so well known to many of our readers that it is hardly necessary now to give a description of this work. Mr. Hopkins decided some months ago that it would be necessary to prepare a new edition of this work in order that the many wonderful discoveries of modern times might be fully described in its pages. Since the last edition was published, wonderful developments in wireless telegraphy, for example, have been made. It was necessary, therefore, that a good deal of new matter should be added to the work in order to make it thoroughly up-to-date, and with this object in view some 200 pages have been added. On account of the increased size of the work, it has been necessary to divide it into two volumes, handsomely bound in buckram.



REVISED and ENLARGED EDITION

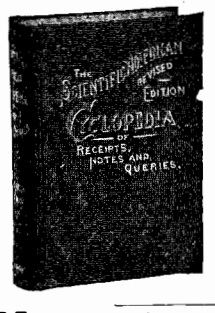
The Scientific American

Cyclopedia

Of Receipts, Notes and Queries.

15,000 Receipts. 734 Pages.

Price, $5.00 in Cloth. $6.00 in Sheep. $6.50 in Half Morocco. Post Free.



This work has been revised and enlarged,

900 New Formulas.

The work is so arranged as to be of use not only to the specialist, but to the general reader. It should have a place in every home and workshop. A circular containing full **Table of Contents** will be sent on application.

Those who already have the Cyclopedia may obtain the

1901 APPENDIX.

Price, bound in cloth, $1.00 postpaid.

MAGIC

Stage Illusions and Scientific Diversions, including Trick Photography.

This work appeals to old and young alike, and it is one of the most attractive holiday books of the year. The illusions are illustrated by the highest class of engravings, and the exposés of the tricks are, in many cases, furnished by the prestidigitateurs themselves. Conjuring, large stage illusions, fire-eating, sword-swallowing, ventriloquism, mental magic, ancient magic, automata, curious toys, stage effects, photographic tricks, and the projection of moving photographs are all well described and illustrated, making a handsome volume. It is tastefully printed and bound. Acknowledged by the profession to be the **Standard Work on Magic.**

By A. A. HOPKINS. 568 pages. 420 illus. Price **$2.50**

MUNN & CO., Publishers, 361 Broadway, NEW YORK

which all four wheels are shaft-driven through bevel gears. The dispensing with chains on a vehicle of this size and construction should be a valuable feature, as such a machine has to go through all kinds of weather and traverse bad road surfaces, and the four long chains heretofore employed were apt to stretch and become clogged with mud. The new trucks are made in several sizes. The drive by all four wheels gives them great tractive power, and makes them able to extricate themselves from almost any position without difficulty.

The Swinehart Solid Cushion Tire.

The Swinehart tire, which was illustrated in our last automobile number, has been used with success by an increasing number of automobilists during the past year, and almost all of these testify to its good qualities as regards resiliency and speed. While it is generally conceded that with an ordinary solid tire a speed of 15 miles an hour is about the limit, several users of the Swinehart tire have traveled in the neighborhood of 40 miles an hour without serious results or great discomfort, and have proved that this tire is applicable to the heaviest and fastest vehicles, as well as to the runabout and light touring car. The large number of testimonials from users of the tire apparently show that the great troubles of shaking to pieces of the car and crystallization of the parts from excessive vibration are not what they were thought to be. The tire is constructed on very different lines from the ordinary solid tire, it having concaved sides, a rigid tread, and a clincher flange on the bottom. The latter makes it possible to use the tire with the ordinary clincher rim employed with pneumatics. The tires are constructed with rather soft rubber, which has great resiliency; and it is due to this fact and to their peculiar shape that they ride much more easily than the ordinary solid or cushion tire. For the automobilist who wishes to be free from the thought of puncture, there is no better substitute for a pneumatic tire than that made by the Swinehart Company.

A Useful Ignition Battery.

An improved form of storage battery for ignition purposes is made by the Witherbee Igniter Company, of this city. The plates are assembled in separate compartments formed by division walls in the containing hard-rubber case, and the lugs are connected to suitable binding posts in the cover. The latter is sealed in the case by a soft rubber edge, and its overlapping top is bolted to flanges on the latter. The new battery has a new form of plate connection inside, and all metal parts that might cause a short-circuit should water accumulate on the top, have been dispensed with. A new form of vent having a large chamber for the separation of the gas from the acid is fitted. The battery is one of the neatest at present upon the market.

A CLEVER MECHANICAL AND ELECTRICAL AUTOMATON.

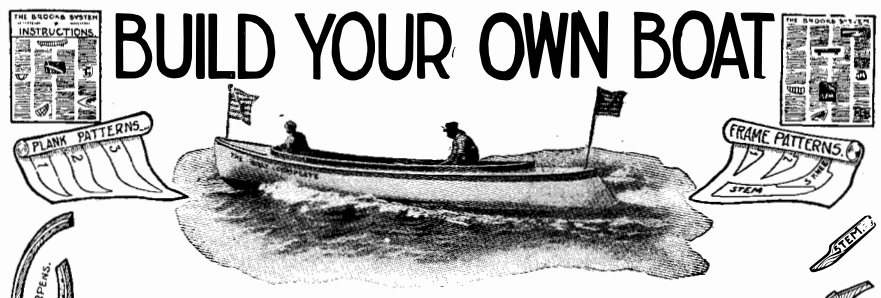
(*Continued from page 46.*)

scending and terminating on the right side at a level with the terminal on the left. Upon this track travel fourteen ball-bearing swinging carriages, their movements being controlled by an electric motor. The carriages are filled with dry storage batteries, the combined weight of which is sixty pounds. These batteries are shifted from one side to the other of the body by means of an electric motor controlled by a mercury governor.

At the back of the figure is the switchboard containing the rheostat, fifteen switches, three single levers, and three automatic brakes, besides several other ingenious devices for directing the movements.

The connections are made, the current switched on, and at a given number of degrees or steps regulated by the centered gear-wheel, working on the cam of the motors, the weights are released from

BUILD YOUR OWN BOAT



BY THE BROOKS SYSTEM

There is no reason why you cannot own as good a boat as the best boat factory can produce if you will use your leisure time to advantage and build it yourself. The fact that anyone using the **Brooks System,** no matter how inexperienced he is in the use of tools, can build his own boat at the cost of a little lumber and a few nails, has brought boats within the reach of all. All the boats built last year, by all the boat factories in the United States, combined in one fleet, would not equal the number of boats built during the same time by novices using the **Brooks System.** Our catalog gives pages of testimonials with photographs of the boats built by amateurs using the **Brooks System.**

The Brooks System consists of exact size printed paper patterns of every piece that goes into the boat, a complete set of halftone illustrations showing an actual picture of each step of the work properly done, detailed instructions to build, covering the entire construction of the boat and an itemized bill of all material required and how to secure it.

We tell you how to lay the pattern of each particular part on the proper piece of material and exactly how to cut—you cut. We then tell you how to fasten each part in its right place—what kind of a nail to use—how to drive it—you drive it.

You need no mechanical ability, the **Brooks System** supplies this—how is shown in the catalog.

Many professional men are taking up the **Brooks System** for mental relaxation—for the pleasure of working with their hands and for exercise.

We have started hundreds in the boat building business. One man built sixteen boats from one set of patterns last season. Another built ten. The materials cost very little. We furnished the design, they did the work and sold the boats at a big profit.

You need buy nothing from us but the patterns. We have them of all kinds and sizes, from small Row-boats and Canoes to Sea-going Yachts. We have over fifty styles and sizes of boats and boat patterns, each one perfect in design for its purpose. Our catalog illustrates the product of the best staff of designers in the world.

Over ten thousand amateurs throughout the world successfully built boats by the **Brooks System** in 1905.

When so ordered, Patterns are Expressed, Charges Prepaid, C. O. D., Allowing Examination.

KNOCK DOWN BOATS

complete from keel to cushions and fittings. We send you a complete Knocked Down Boat, even to the paint at a cost of very little more than the cost of the raw material.

ILLUSTRATED CATALOG OF ALL OUR BOATS FREE

BOOKS WE PUBLISH :

Useful Information for the Amateur Yachtsman and Boat Builder. Price 25 cents
The Principles and Operation of Marine Gasoline Motors. Price 25 cents
Book of Designs for Practical Boat Builders. Price 25 cents

BROOKS BOAT MFG. CO.

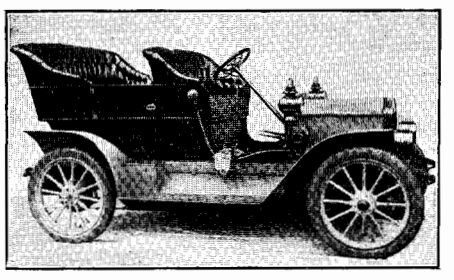
Originators of the Pattern System of Boat Building

401 Shi› Street Ba› City Mich., U. S. A.

OSCAR LEAR FRAYER-MILLER AUTOMOBILES

Four-Cylinder, 25 H. P. $3,000 Six-Cylinder, 40 H. P. $4,000

The Car that is cooled through Air Jackets.



Economical, Noiseless, Speedy, Successful always.

Holds numerous records—among others, 3,202 miles in 6 days 15 hours 29 minutes (record), the last 1,866 miles without stop of engine (record).

OSCAR LEAR AUTOMOBILE CO.

COLUMBUS, OHIO

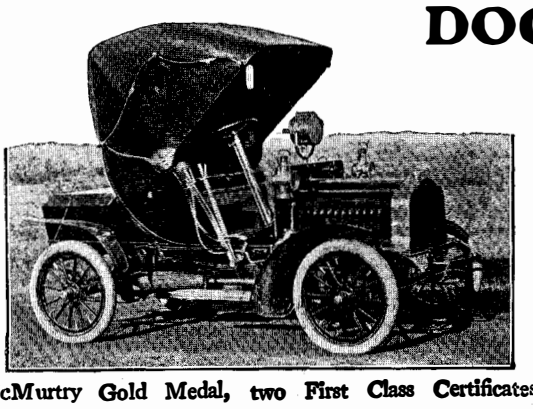
At the "Old Show in the New Armory" 69th Regiment, New York.

FRAYER-MILLER AUTO CO.
Broadway and 65th St., New York, N. Y.

Compound

DOCTOR'S STANHOPE

16 H. P. $1400.



Chassis is the same as used in our Model Four Light Touring Car which carried five people in the New York Motor Club's recent Economy Test and defeated every touring car entered, winning the McMurtry Gold Medal, two First Class Certificates and one other Medal.

THE E. H. V. COMPANY. MIDDLETOWN, CONN.

their normal center and rapidly descend into the abdominal cavity on the right, causing the figure to lean forward at an angle of 20 degrees. The motor controlling the left limb being in full operation throws its member forward, the figure being in such a position that this free and rapid movement swings it round to the right; at the same instant the mercury governor, finding its level, forms an electric contact, setting in motion the motor, which rapidly draws the weights back to the line of gravity and causes the figure to regain its equilibrium. By changing the gear wheel, which controls the number of steps, the distance traversed is increased or decreased.

The figure also writes its name, "Enigmarelle," upon a blackboard. The arrangement by which this is done is said to be a series of electro-magnets in the shoulder. These attract an armature in the upper arm and cause the latter to make certain strokes.

The method by which the crowning feat, that of riding a cycle, is accomplished is similar to the walk. At a given number of revolutions the weights again descend into the abdominal cavity, but in this instance on the left, causing the cycle and figure, which are attached, to lean toward the center, at an angle of about 40 deg. with the perpendicular, so that the figure, like a coin or wheel, starts round a circle. The arm locks the handlebar at an angle such that the bicycle will turn the circle desired and the feet revolve the pedals and drive the machine in the regulation manner.

[The photographs of this automaton were submitted to the managers of a well-known New York theatrical enterprise and they at once stated that they had seen the automaton in London and that there was really a man concealed in the midst of this aggregation of machinery.—Ed.]

A 4,000-mile road test of pneumatic and solid tires will be started by the Automobile Club of Great Britain February 1. A complete set (four tires) of each make represented will be placed on an automobile of the weight which such tires are intended to carry. The four main classes are cars weighing, with occupants, 1,500, 2,400, 3,000, and 4,500 pounds respectively. There will be a special class for armored, or otherwise protected, tires. Such tires are to be used on cars of 3,000 pounds weight. In awarding the prizes the size, weight, and price of the tires in relation to the weight carried will be considered. The rules are very strict, and an accurate account will be taken of any extra tires, tubes, or protective devices supplied to the competitors during the course of the test. Any parts replaced are considered as worn out, and charged against the competitor. In the event of a set of tires lasting out the test, the competitor has the privilege of continuing this test at an expense of $10 a day for the use of the car. The test will be continued under the auspices of the club.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending January 2, 1906.

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Adding machine, W. F. Smith	808,696
Adding machine, E. R. Beach	808,893
Agricultural implement, etc., coupling, W. L. Paul	808,677
Air brake setting device and alarm, Adreon & Stambaugh	808,711
Air compressors, automatic electrical controller for, F. D. Ackerman	809,083
Air treating apparatus, W. H. Carrier	808,897
Alkali, making caustic, H. S. Blackmore	809,089
Alkali, producing caustic, H. S. Blackmore	809,088
Ammunition package, W. Mayer	808,854
Ammunition wagon, tilting, W. Mayer	808,855
Amusement device, T. Wirth	808,796
Anchor, earth, G. F. Swortfiger	809,032
Animal trap, G. J. Miller	809,203
Annealing metal, W. R. Eaches	808,911
Annunciator, A. Carliss	808,723
Anticreeping device, J. R. Leighty	809,193
Arch centering, L. Schuller	808,951
Awning, A. F. Winberg	808,963
Axle box, car, W. F. Richards	808,684
Axle, metal, E. Einfeldt	808,735
Axle, vehicle, C. Hunze	808,844
Badge, D. W. Perry	808,867
Baling press, J. R. Robinson	808,780
Baling press, E. L. White	808,795
Baling press, W. S. Livengood	808,996
Ball, R. Appleyard	808,713
Balloon, navigable, A. Chiodera	809,093
Barrels and the like, carrier for, J. Mitchell	809,003
Basin, receiving, A. Lutz	809,201
Bed, invalid, Goodson & Nason	809,051
Bed, spring, G. C. Locklin	808,667
Beds, head rest for, J. D. Smock	808,700
Beds, mattress holder for folding, V. J. Gillett	809,049
Bedstead, folding, H. H. Blaylock	809,167
Bedstead, metallic, P. P. Oedbauer	808,866
Beer, pasteurizing, C. H. Loew	808,668
Beet seeder, sugar, F. Tiemann	809,233
Bending machine, R. Mobley	808,672
Beta-ethyltetramethyldiaminoglycerin, benzoyl chlorid derivative of, F. Hofmann	808,748
Beta-substituted ester of diaminoglycerin and making same, F. Hofmann	808,747
Bevel gage for handsaws, H. Condren	808,971
Billiard table leg, adjustable, C. D. Seymour	809,078
Binder, temporary, C. Whetham	808,793
Bobbin tray, J. Lloyd	809,195
Boiler flue cleaner, A. Gronvald	808,982
Boiler setting and blocks therefor, H. S. Marsh	808,853
Boilers, tool for spreading the tubes of water tube, Heely & Keers	808,920
Bolt mechanism, multiple, S. S. Hawley	809,184
Bolting machine, J. M. Case	808,724
Bonding or tying device, W. B. Thines	809,231
Book, note, Hackmann & Palmer	808,652
Book, sales check, A. L. McLeish	808,865
Boot and shoe protector, C. W. Linthicum	808,666
Bottle closure, Brodnax & King	808,629
Bottle closure, J. Herrington	809,258
Bottle holder, nursing, P. A. A. Killam	808,848
Bottle holding rack, O. Eick	808,824
Bottle, hot water, E. J. Schutz	809,141, 809,142
Bottle, non-refillable, F. M. Osgood	809,212
Bottle, non-refillable, F. J. Davis	809,249
Bottle or jar, dispensing, Willis & DuMond	809,159
Bottle stopper, H. E. Lazarus	808,934
Bottles, making hot water, E. J. Schutz	809,143
Bouquet holder, J. Burdick	809,172
Bowling alleys, ball return mechanism for, F. W. Brinkmeyer	809,245
Box opener, C. Goldmann	809,050
Box shook forming machine, H. A. Gale	808,742
Bracelet, J. Bagnall	808,805
Bracelet joint, N. C. Wallenthin	809,153
Brake apparatus, load, W. V. Turner	808,703
Brake mechanism, H. S. Beeney	809,165
Brake system, C. E. Barry	808,716
Brick tongs, Skov & Forberg	809,146
Bricks, manufacture of sand lime, A. Gordon	809,053
Bridge, truss, W. J. Humphreys	809,264
Bridges, etc., means for supporting the expansive ends of, P. B. Motley	809,071
Brooder, C. J. Becker	808,808
Bucket, grab, A. E. Brown	808,630
Building, dismountable, J. Aradi	809,163
Button or stud, separable, W. N. Kidder	808,988
Caisson, floating, A. C. Cunningham	808,728
Caisson for repairing drydock bottoms, floating, A. C. Cunningham	808,638
Calculating machine, E. S. Ensign	809,047
Calculator, A. Rechnitzer	809,075
Calorimeter, Schutte & Korting	808,693
Candle, C. A. Spies	808,698
Candy dusting machine, P. Haase	809,182
Cans, apparatus for detaching the heads from the bodies of sheet metal, S. K. Green	809,108
Car coupling, W. W. Gordon	809,255
Car coupling device, E. Grafstrom	808,651
Car, dumping, Hubbard & Taylor	808,750
Car, dumping, P. Schneider	809,016
Car grain door, M. G. Donehew	808,906
Car, railway, J. C. Cottrell	808,817
Car seat, Bennett & Walker	809,084
Car seat, walk over, S. M. Curwen	808,905
Car signal, A. S. Macreadie	808,937
Car starting and stopping device, R. Maw	808,939
Car, tie preserving cylinder, E. B. B. Kuckuck	808,761
Carbureter and igniter for hydrocarbon engines, A. B. Goodspeed	808,915
Carrier mechanism, L. C. Kahl	808,758
Cart, logging, M. E. Spears	808,881
Cart, street sweeper's, G. Focht	808,739
Cement block machine, M. Eckley	808,643
Cement block machine, F. B. Dysart, 809,252,	809,250
Cement tile machine, F. B. Dysart	809,251
Chain, S. Schisgall	809,015
Chain, J. M. Joyce	809,113
Chair, H. H. Hoover	809,061
Chair adjusting screw, revolving, H. G. Hunn	808,927
Check loop, W. C. Ladd	808,850
Checkrein, W. Williamson	808,961
Chronometer escapement, A. Brown	808,631
Churn, F. Swallow	809,031
Churn dasher, W. L. Hart	808,743
Cigar, C. F. Zenker	809,162
Cigarettes, appliance for cutting off and creasing, F. J. Ludington	808,851
Circuit controller, R. Varley	808,957
Clamp, E. R. Wingate	808,708
Clamp, P. F. Denning	808,731
Clock, repeating alarm, W. E. Porter	809,133
Clothes line support, P. J. Sloan	809,024
Clothes pin, D. R. Rosebrough	808,687
Clothes tongs, F. L. Blomquist	809,244
Clutch, R. L. Woodard	808,965
Clutch, friction, F. H. Ball	808,622
Clutch, friction, H. G. Dittbenner	808,975
Coffee pot, M. M. De Grody	808,730
Coiling machine, M. C. Lovejoy	809,269
Coke handling apparatus, G. G. Fryer	808,741
Collapsible table, W. L. Broadwell	809,170
Collar, F. W. Parsons	809,009
Collar protector, J. F. Connell	808,816
Collector ring, H. G. Reist	809,220
Compasses, adjusting mechanism for screw threaded needle point insertions of, J. Eichmuller	808,644
Compo board machine, Johnson & Porter	808,756
Composition of matter, D. Lichtenstein	809,068
Concentrator, solution, J. U. Lloyd	808,997
Concrete, mixing, P. C. Hains	808,836
Concrete structural work, interior, F. C. Caine	809,090
Conveyer, Miller & Dickinson	808,858
Conveyer belt support, A. W. F. Steckel	809,227
Cooking utensil, J. R. Nye	809,129
Copy holder, J. S. Dudley	809,821
Corn popper, H. W. Eakins	808,734
Cotton chopper, J. W. Haynie	809,109
Cotton gin, F. Phelps	809,131
Cotton marker, self-fastening, G. W. Long	809,197
Crane, window, T. E. French	809,104
Cream cooler and aerator, M. Mortensen	809,125
Cultivator and seed drill, interchangeable, J. B. Smiley	809,025
Curette, finger, M. J. C. Leuchs	809,119
Curtain fastener, J. Schneider	809,140
Cut off socket, D. H. Haywood	808,656
Cut off socket, O. Saugstad	808,689
Cutter head gage, E. A. Walker	809,037
Damper, time controlled, S. B. Brown	808,896
Dental flask handle, T. G. Lewis	808,935
Dental silk box, O. C. Schulz	808,690
Dies for die stocks, machine for cutting, H. W. Oster	809,007
Disappearing seat, C. K. Pickles	808,679
Diseased tissues, apparatus for treating, Ciolfi & Case	808,635
Disinfecting apparatus dropper, W. H. Rose	809,014
Display rack or stand, H. M. Willis	808,962
Distilling and condensing, J. S. Forbes	808,649
Door, N. P. Sjobring	809,145
Door bolt and means for operating the same, W. B. Morewood	808,673
Door check or fastener, C. N. P. Ingalls	809,062
Door support, sliding, L. Holmer	808,749
Dowel, P. L. E. Drolshagen	809,177
Doweling machine, J. L. Lovett	809,069
Draft equalizer, N. N. Egge	808,823
Draper, W. T. Gordon	808,916
Draw bar centering device, M. A. Garrett	809,181
Drawings and documents transparent and waterproof, apparatus for rendering, C. L. Crabb	808,901

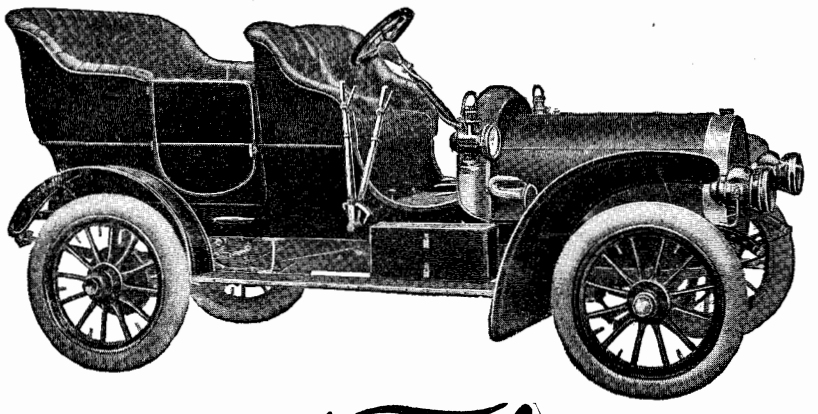
National

RELIABILITY

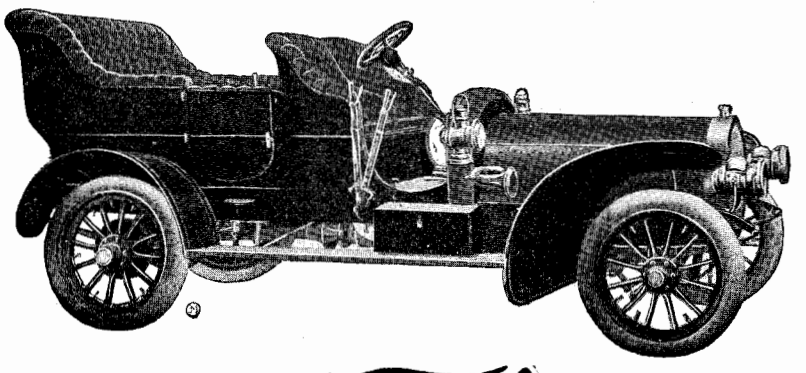
was demonstrated in the most convincing manner at Indianapolis, November 16-17, 1905, when a National Stock Car made **1094 3-16 Miles in Twenty-four Hours, Breaking the World's Record by 78 9-16 Miles.**

"Watch for the Round Radiator"

at the New York Show, 69th Regiment Armory
JANUARY 13 to 20, 1906
at the Chicago Show, Coliseum, Spaces 76, 77 and 78
FEBRUARY 3 to 10, 1906



National
Model "D" 4 Cylinders, 35-40 H.P.
$3,000
THE CAR THAT BROKE THE WORLD'S RECORDS



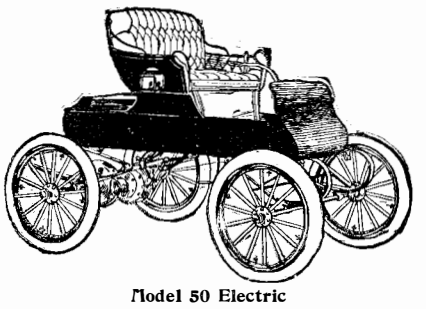
National
Model "E" 6 Cylinders, 50-60 H.P.
$4,000

A new model with a powerful, smooth-running, 6-cylinder engine, seating 7 passengers comfortably, and all facing forward. Aluminum body, luxuriously upholstered, etc.

An interesting innovation in touring cars

National
ELECTRICS

The Ideal Car for City Use



Clean Quiet Comfortable Convenient

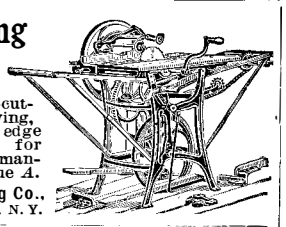
Model 50 Electric

Write for Particulars

NATIONAL MOTOR VEHICLE CO.
1019 East 22d Street, Indianapolis, Indiana

DISTRIBUTERS:
Linscott Motor Co., 163 Columbus Ave., Boston.
Homan & Schulz Co., 38th St. and Broadway, New York City.
Tioga Automobile Co., Broad and Tioga Sts., Philadelphia.
Ralph Temple Auto Co., 311 Michigan Ave., Chicago.
Liberty Automobile Co., 138 Beatty St., E. E., Pittsburg.
National Motor Car Agency, 705 South Main St., Los Angeles.

Wood-working Machinery



For ripping, cross-cutting, mitering, grooving, boring, scroll-sawing edge moulding, mortising; for working wood in any manner. Send for catalogue *A*.

The Seneca Falls M'f'g Co.,
695 Water St., Seneca Falls, N. Y.

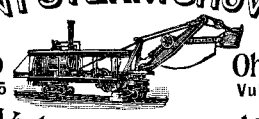
Engine and Foot Lathes

MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. BEST MATERIALS. BEST WORKMANSHIP. CATALOGUE FREE

SEBASTIAN LATHE CO., 120 Culvert St., Cincinnati, O.

Foot and Power and Turret Lathes, Planers, Shapers, and Drill Presses
SHEPARD LATHE CO., 133 W. 2d St. Cincinnati, O.

GIANT STEAM SHOVELS

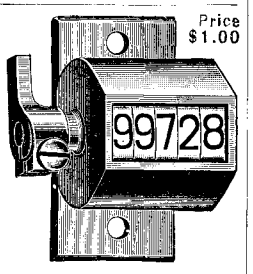


Toledo 125 Ohio, U.S.A. Vulcan Place

The Vulcan Iron Works Co.

Veeder Counters

to register reciprocating movements or revolutions. Cut full size.



Price $1.00

Booklet Free

VEEDER MFG. CO.
Hartford, Conn.

Cyclometers, Odometers, Tachometers, Counters and Fine Castings.

ICE BOATS!

If you want to know how to make an Ice Boat, buy SCIENTIFIC AMERICAN SUPPLEMENT **1556**. Complete working drawings and a thorough description are published. Order from your newsdealer or from **Munn & Co., 361 Broadway, New York**

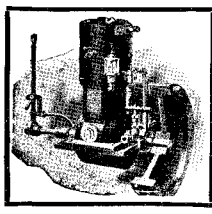
A. W. Faber.

Manufactory Established 1761.

Lead-Colored Slate Pencils, Rubber Bands, Erasers, Inks, Penholders, Rulers, Water Colors, Improved Calculating Rules.

Send for descriptive Circular S.

44-60 East 23d Street, New York, N. Y.
Grand Prize, Highest Award, St. Louis, 1904.



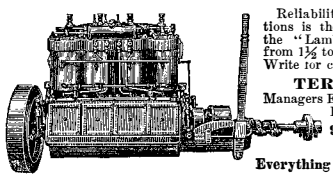
Carriage Motors

For Bicycle, Contact or Jump Spark

One Piece Casting. Light Weight. Large Bearing Surfaces. Write us to-day

GRANT-FERRIS CO.
Troy, N. Y.

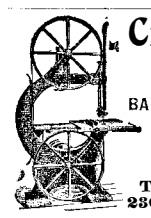
RELIABLE MARINE ENGINES



Reliability under all conditions is the characteristic of the "Lamb" Engines. Sizes from 1½ to 100 H. P. in stock. Write for catalogue.

TERRY & CO.
Managers Eastern and Foreign Branch
92 Chambers St., New York

Everything for Boat & Engine



Crescent Machinery

Quality and Price, both right

BAND SAWS, JOINTERS, SAW TABLES, BAND SAW BLADES

Catalogue tells the rest

THE CRESCENT MACHINE CO.
230 Main Street, Leetonia, O., U. S. A.

POULTRY BOOK FREE

Helpful advice on poultry raising, 228 pages; (8x11), 500 illustrations. 7 practical chapters. Describes the

Standard Cyphers Incubator

1906-pattern; sold on 90 days trial. Catalog FREE if you mention this paper and send addresses of two near by poultry raisers. Write nearest office.

Cyphers Incubator Co., Buffalo, Chicago, Boston, New York, Kansas City or San Francisco.

How To Increase Your Business

READ carefully, every week, the **Business and Personal Wants** column in the

Scientific American

This week it will be found on page 49.

Some week you will be likely to find an inquiry for something that you manufacture or deal in. A prompt reply may bring an order.

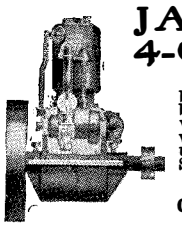
Watch it Carefully

Dredge, levee building suction, F. V. Wright	808,800
Drills for rock boring and other purposes, appliance for lifting and turning, C. Simmons	808,876
Dumb bell and Indian club, S. C. Villedrouin	808,706
Dye and making same, red azo, J. Hagenbach	808,919
Dye, yellow anthracene, M. Kugel	808,762
Electric generator, B. P. & F. I. Remy	808,779
Electric motor control system, M. W. Day	808,729
Electrical battery, C. Jager	808,755
Electrical devices, adjustable suspender for, A. Berry	808,894
Electrolytic apparatus, H. S. Blackmore	809,085
Electrolytic processes, producing circulation in, Koller & Askenasy	809,116
Elevator, G. R. Layman	809,117
Elevator mechanism, W. Crossley	808,637
Elevator safety device, I. B. Ritter	809,076
Enameled ornament, O. L. Heintz	808,744
Engine starting means, gas or similar, F. L. Orr	809,211
Engines, spark ignition system for explosion, R. Varley	808,958
Eraser holder, F. W. Hayes	809,056
Excavator, F. F. Collath	808,636
Excavator dippers, latching mechanism for, M. O'Connor	809,209
Exercising apparatus, handle or grip of dumb bells or other, H. Fairbrother	808,737
Explosive engine, J. F. Johnson	809,185
Extensible handle, D. Lawson	808,992
Extinguisher, A. Haslinger	809,055
Eyeglass mounting, G. W. Wells	809,156
Eyeglasses, E. B. Meyrowitz	809,001
Farm gate, C. R. Price	808,869
Faucet, F. A. Dunham	808,910
Feather fabric, felted, Warren & Holden, 808,791,	808,792
Feather fabric, woven, Warren & Holden	808,790
Feed gage, L. E. Tait	808,953
Fence anchor and driver, J. M. Van Meter	808,704
Fence machines, spindle brake device for wire, Backlin & Eklund	808,892
Fence post, M. L. Boyce	808,969
Fertilizer and seed distributer, H. C. Melton	808,856
Fertilizer distributer, A. J. Woolman	808,799
Fiber disentangling machine, D. C. Fisher	808,978
File and cabinet, bill, O. A. Osmondson	809,006
File, paper, L. E. McLaughlin	808,864
Filtering, purifying, and decanting apparatus, H. Desrumaux	809,099
Filtering system, H. L. Hollis	808,924
Fire box, Burger & Williams	809,247
Fire escape, Thole & Ott	809,033
Firearm firing mechanism, G. E. Witherell	808,964
Firearms, single trigger mechanism for, G. E. Witherell	808,890
Fruit squeezer, D. H. Mosteller	808,861
Furniture, convertible, C. W. Dunn	808,822
Gage attachment, safety, I. W. Houston, et al	809,110
Game apparatus, Vinson & Robinson	808,959
Garment hanger, Hall & Donaldson	808,653
Garment supporter, H. F. Niles	809,074
Garment supporter, B. F. Orewiler	809,210
Gas burner, safety, S. W. Ekroos	808,825
Gas controller for flash lights and the like, R. C. Roehl	809,077
Gas danger signal, automatic, P. A. Kettering	808,929
Gas engine, N. Crane	808,902
Gas generator, N. Goodyear	808,650
Gas producer, Skinner & Sheaffer	809,023
Gas producer valve, F. G. Hobart	809,261
Gas producers, preventing the formation of clinker in, J. E. Sheaffer	809,021
Gas retorts, stand pipe and connection for, S. J. Fowler	808,831
Gases, apparatus for dehydrating compressed, R. P. Pictet	809,219
Gases from their mixtures, apparatus for the separation of, R. P. Pictet	809,218
Gasket making machine, J. W. Guillott	809 256
Gate. See Farm gate.	
Gear casing, F. H. Lincoln	808,995
Gearing, change, C. H. A. Dissinger	808,732
Glass articles, machine for making necked, H. Semple	808,874
Glass furnace, W. M. Anderson	808,804
Glass furnace, H. M. Brookfield	808,810
Golf ball, F. H. Richards	808,683
Golf ball, W. I. Thomas 809,034,	809,035
Gong attachment, J. T. Duff	808,908
Goods receptacle, paneled, J. I. McVoy	809,005
Grab hook, F. J. Morrison	808,860
Grader, road, F. B. Drewes	808,820
Grain drill seedbox, C. L. Fowle	808,979
Grinder, G. W. Golden	809,254
Gun, air, D. F. Polley	808,680
Gun attachment, A. T. Wight	809,080
Guns, firing mechanism for breech loading, G. Gerdom	809,107
Hair drier, F. S. Emmons	808,645
Hair pins, mold for the manufacturing of, T. Roos	808,949
Hame and trace connector, F. F. Hodges	808,840
Harrow, G. A. Truckenbrod	809,150
Harvester reel, J. Pearce	809,216
Hat fastener, J. C. Morrison	808,674
Hay and manure gatherer and loader, J. Peterson	808,678
Hay press power, W. S. Bryant	808,633
Hay racks or the like from or to their running gear, device for removing or replacing, G. P. Finch	808,913
Head block, H. C. Lindsly	808,665
Heating apparatus, W. S. Washburn	809,154
Heating apparatus, O. S. McCurdy	809,207
Heating apparatus, hot water, Beames & Walton	809,164
Heel building machine, W. Wolfe, reissue	12,433
Hinge, J. Soss	809,027
Hinge, flush, T. F. Saling	809,137
Hinge, gate, J. A. Jones	808,757
Hinge, wire, Reece & Austin	809,134
Hitching post, W. H. Luquire	808,999
Hoist, hydraulic, U. Harvey	808,655
Hoist or elevator, C. A. Juhl	809,066
Hoister drums, automatic holdfast for electric, A. Lambert	808,763
Hoisting apparatus, Knox & Ferris	808,990
Hoisting machine, W. M. Brown	808,632
Hollow bodies, apparatus for forming serpentine, K. Park	808,943
Hook, L. Jones	809,065
Horse blanket, P. Andersen	808,803
Horse power calculating device, E. M. Scoville	809,019
Horseshoe, J. T. Bell	808,626
Horseshoe, J. Singleton	809,144
Horseshoe attachment, J. P. Gegner	809,105
Horseshoe calk, E. F. Atherton	808,891
Horseshoe pad, A. Fischer	808,829
Horseshoe, rubber, A. Lang	808,933
Hot water circulating apparatus, A. B. Reck	809,013
Hydrant, V. H. Mills	808,859
Ice can filler, G. S. Bowling	808,809
Ice machine, R. S. Cates	808,898
Illuminant, J. Lewy	809,121
Index card, Duncan & Tevander	808,909
Index, station meter, McDonald & Scofield	809,127
Induction apparatus contact device, R. O. Hood	809,262
Induction coil vibrator, R. Varley	809,235
Induction motor, A. L. Cushman, reissue	12,431
Insulator, electric light fixture, L. McCarthy	809,126
Internal combustion engine, S. S. Williams	809,081
Internal combustion engine, T. Wright	809,082
Invalid lift, O. B. Thompson	808,785
Iron compounds, making stable non-alcoholic, K. Dieterich	809,101
Jewelry catch, R. Kollmar	808,760
Joint for sheet metal and the like, E. P. Lehmann	808,766
Kiln. See Updraft kiln.	
Knitting machine, B. T. Steber	808,784
Knitting machine stop motion, E. Tompkins	809,234
Knob, K. Booth	808,627
Labels and the like to bottles and other articles, machine for applying, B. W. Tucker	808,955
Ladder attachment, J. K. Hester	809,057
Lamp burner, W. M. Merchant	808,770
Lamp burner, D. Joyal	809,112
Lamp safety shield, miner's, R. I. Jenkins	809,111
Lantern burner device, tubular, D. C. Kline	808,930

Troubled with Faulty Ignition?

Equip your car, launch or engine with the **Apple Automatic Battery Charger,** easily installed. Quickly puts an end to all battery troubles by keeping them always supplied with "juice." With this machine on your car your current will never fail at awkward moments, leaving you "stalled" far from home. See us at N. Y. and Chi. Auto Shows. **The Dayton Electrical Mfg. Co.,** 98 Beaver Bldg., Dayton, Ohio.

JAGER Marine 4-Cycle Engines



Skillfully designed and well built. Single lever control, combining automatic carburettor with spark advance. Develops wide speed range and reliability under most trying conditions. Sizes 3 to 60 h. p. Send for catalog.

CHAS. J. JAGER CO
Cor. High and Batterymarch Sts., Boston, Mass.

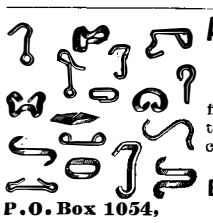
WORK SHOPS

of Wood and Metal Workers, without steam power, equipped with

BARNES' FOOT POWER MACHINERY

allow lower bids on jobs, and give greater profit on the work. Machines sent on trial if desired. *Catalog Free.*

W. F. & JOHN BARNES CO.
Established 1872.
1999 RUBY ST. ROCKFORD, ILL.



Automatic Machines FOR FORMING WIRE

from coil into shapes similar to cuts. We can furnish machines or goods, as desired.

Send for Catalogue.

P.O. Box 1054, BLAKE & JOHNSON, WATERBURY, CONN.

PATENTS

Our Hand Book on Patents, Trade-Marks, etc., sent free. Patents procured through Munn & Co. receive free notice in the

SCIENTIFIC AMERICAN

MUNN & CO., 361 Broadway, N. Y.
BRANCH OFFICE: 625 F St., Washington, D.C.

ARTESIAN

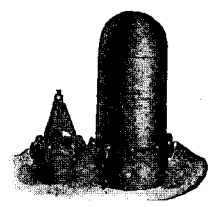
Wells, Oil and Gas Wells drilled by contract to any depth from 50 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 1200 feet. Write us stating exactly what is required and send for illustrated catalogue. Address

PIERCE WELL ENGINEERING AND SUPPLY CO.
136 LIBERTY STREET, NEW YORK, U. S. A.

NEW YORK SCHOOL OF AUTOMOBILE ENGINEERS
Incorporated
147 West 56th Street, New York City
Under the personal direction of
PROF. CHAS. E. LUCKE, M. E., Ph.D.
School of Engineers, Columbia University

Departments include machine tool and forge shops, assembling and test shops, and every type of motor; also laboratories completely and specially equipped to teach all component parts of automobiles.

Day and Evening Classes.
SPECIAL COURSES FOR OWNERS.



An Automatic Pump

that works wherever there is a spring, creek or pond. It costs but little and works day and night without attention or expense. **The Niagara Hydraulic Ram,** USED AND ENDORSED BY THE U. S. GOVERNMENT. Is made in all sizes. Free booklet and terms to agents upon request.

Niagara Hydraulic Engine Co
140 NASSAU ST., NEW YORK
Factory Chester, Pa.

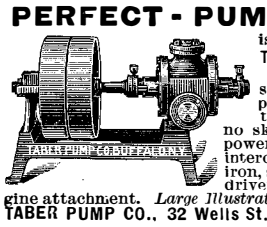
THE OBER LATHES

For Turning Axe, Adze, Pick, Sledge, Hatchet, Hammer, Auger, File, Knife and Chisel Handles, Whiffletrees, Yokes, Spokes, Porch Spindles, Stair Balusters Table and Chair Legs and other irregular work.

Send for Circular A.

The Ober Mfg. Co., 10 Bell St., Chagrin Falls, O., U.S.A.

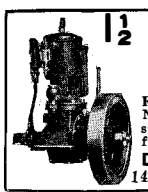
PERFECT - PUMP - POWER



is attained only in the TABER ROTARY PUMPS

They are mechanical, simple and durable. Will pump hot or cold fluid, thin or thick. Requires no skilled mechanic Most power at least cost. All parts interchangeable. Made of iron, steel or bronze. Can be driven by belt, motor or engine attachment. *Large Illustrated Catalogue free.*

TABER PUMP CO., 32 Wells St., Buffalo, N.Y.. U. S. A.



1½ H. P. MARINE ENGINE

$33.50 Engine Only

Engine and Engine Fittings $37.50
For your Row Boat, Sail Boat or Launch
No cranks to start—No cams, valves, gears, springs or sprockets. All working parts in full view. We build all sizes Boat Engines.

DETROIT ENGINE WORKS,
1425 JEFFERSON AVE. DETROIT, MICH.

The "VALET" Chair

Presses and creases the trousers over night, takes care of coat, hat and shoes, and has an adjustable shoe tree which holds the shoes so they may be polished while seated. No dirt can escape to muss up the room. The "Valet" Chair saves the clothes and from 50c to $1.00 a week. Made in all woods to match other chamber furniture. Ask for catalogue showing different designs in natural colors.

Hardesty Mfg. Co. Dept. L, Fisher Bldg. Chicago

PRICE $1.00 Charter Oak Watch

A reliable, well made, thin watch, Stem Wind and Stem Set, made on principles of expensive timepieces, nickel finished case.

Fully Guaranteed For One Year.

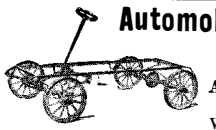
Remember, you are not in the habit of buying a Stem Winding Watch at so low a price.

Money refunded after 10 days' trial if not satisfied.

Price $1.00, postage five (5) cents Send for complete list.

Charter Oak Watch Co.
98 Asylum St., Hartford, Ct.

Automobile Running Gears



With pressed steel or angle iron frames

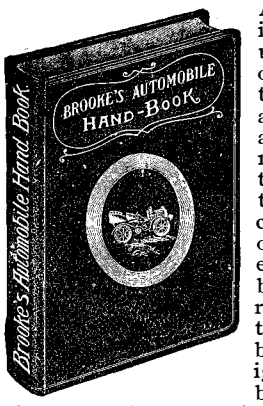
Also all Styles of Bodies

Write for catalogue at once, mentioning this paper.

H. F. BORBEIN & COMPANY
2109 North Ninth Street, St. Louis, Mo.

Brookes' Automobile Handbook

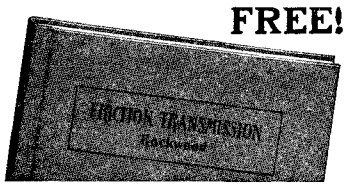
By L. ELLIOTT BROOKES



A work of practical information for the use of owners, operators and automobile mechanics, giving full and concise information on all questions relating to the construction, care and operation of gasoline and electric automobiles, including road troubles, motor troubles, carbureter troubles, ignition troubles, battery troubles, clutch troubles, starting troubles. The perusal of this work for a few minutes, when troubles occur, will often not only save time, money, and worry, but give greater confidence in the car. With this book your troubles are over. Pocket size 4 x 6½, 320 pp., over 100 illus. Popular edition, full leather, limp, price $1.50 prepaid. Write for *complete catalogue.* Address

Frederick J. Drake & Co., 234 E. Madison St., Chicago

FREE!



An Engineering Treatise Well Worth Having

HERETOFORE there have been many unknown quantities in dealing with problems of friction transmission, so essential in all modern machinery. This book contains information and tables that help to correctly solve these problems. It was prepared with accurate care by a number of very able engineers and is copyrighted.

If your business or work is such as to require this help, we shall send you the book without cost. A postal card telling your occupation will bring it Address

The Rockwood Mfg. Co.
1904 English Ave. Indianapolis, U. S. A.

SPARK COILS

Their Construction Simply Explained

Scientific American Supplement 160 describes the making of a 1½-inch spark coil and condenser.

Scientific American Supplement 1514 tells you how to make a coil for gas-engine ignition.

Scientific American Supplement 1522 explains fully the construction of a jump-spark coil and condenser for gas-engine ignition.

Scientific American Supplement 1124 describes the construction of a 6-inch spark coil

Scientific American Supplement 1087 gives a full account of the making of an alternating current coil giving a 5-inch spark.

Scientific American Supplement 1527 describes a 4-inch spark coil and condenser.

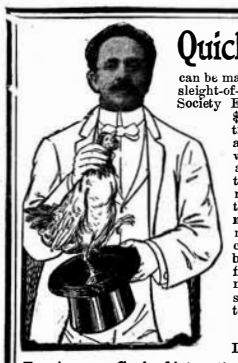
Scientific American Supplement 1402 gives data for the construction of coils of a definite length of spark.

The above-mentioned set of seven papers will be supplied for 70 cents.

Any single copy will be mailed for 10 cts.

MUNN & COMPANY, Publishers
361 Broadway New York

Lathe, screw making and metal turning, Trueman & Cleghorn 808,887
Lathe work rest, W. F. Parsons 808,676
Laundries and the like, garment marker for, D. C. Voss 808,788
Leaching tank, A. B. Mouck 808,675
Leaf holder for use in transferring entries, J. M. D. McGregor 809,128
Leather working machine, F. J. Perkins... 809,010
Lens mounting for eyeglasses, J. R. Van Tassel 808,888
Level, spirit, J. A. McCain 808,862
Level, spirit, Brown & Clouse 809,275
Lift separator, automatic, S. W. Sinsheimer 809,022
Lighter, A. E. Caughey 808,725
Lightning arrester, F. A. Stafford..... 808,882
Linotype machine, M. W. Morehouse 808,772
Linotype machine, J. R. Rogers..... 808,873
Linotype machine attachment, J. H. W. Knoop 808,931
Liquid combustibles, apparatus for vaporizing, J. Luhne 809,200
Locomotive ash pit and blower, H. E. Parson 809,215
Locomotive, electric, A. F. Batchelder.... 808,717
Locomotive engine, J. E. Roberts..... 808,685
Loom shuttle spindles, pivot bolt for, C. F. Thompson 808,885
Loom tension device, E. Herzig 808,658
Loom, weft replenishing, H. W. Wyman.. 808,966
Loom, weft replenishing, C. Whalley.... 809,158
Looms, cloth tension device for take up mechanism for, C. S. Andem 809,239
Mail bag catcher, L. J. Evans 808,646
Mail box, Raymond & Stoughton 808,872
Mail box bulletin, J. M. Larsh..... 808,764
Mail deliverer, H. L. Kimmons 809,187
Mail pouch fastener, L. H. Hinaman..... 809,058
Mail transferring device, C. Kreps..... 808,932
Map case, Dawson & Rosen 809,175
Match making machine, E. J. Prindle..... 808,945
Match making machine, automatic, G. P. Loomis 808,767
Matte, converting, C. M. Allen..... 808,618
Matte, treating molten, W. E. Koch.... 808,849
Measuring device, liquid, F. S. Turner, et al 809,273
Measuring tape, E. L. Saxton 809,139
Measuring vessel, computing, W. S. Cain 809,091
Mechanical movement, A. W. Hutchins.... 808,928
Mechanical movement, R. T. Wingo..... 809,160
Metal bars, etc., machine for bending, N. S. Arthur 808,619
Metal bars, shaping, E. Einfeldt..... 808,736
Metal, planishing sheets of, A. Ridd.... 808,691
Metal treating and amalgamating apparatus, G. P. Tyars 808,787
Metals, apparatus for the agitation of solutions used in electrodeposition of, Wood & Oaksford 808,798
Micrometer, quick adjusting, Starrett & Adell 809,272
Milk preserve and making same, L. Sarason 809,138
Mining cage landing chair, G. H. Denton. 809,176
Mining machine, D. R. Murphy..... 809,206
Mitt, base ball catcher's, J. Gamble..... 808,980
Mold, W. H. Lucas 809,199
Mold, Johnson & Meyer 808,846
Mop holder, H. Bitner 809,243
Motor control system, W. B. Potter..... 808,778
Motor reverser, alternating current, Porter & Currier 808,944
Motors, equalizing winder for spring, C. Pfeiffer 809,130
Musical instrument, autopneumatic, W. Crippen 808,903
Musical instrument, string, F. P. Alexander 808,802
Musical instruments, pneumatic action of, M. S. Wright 809,039
Nail, secret, W. J. Boda 809,968
Napkin, sanitary, P. S. Bauer 808,624
Nest for laying hens, trap, C. B. Williams. 809,038
Nut lock, automatic, J. T. Clark..... 809,044
Oar, bow facing, F. L. Buff 808,720
Ores and metalliferous sands, applying heat for the treatment of, W. J. Jackson.. 808,754
Ores, treating, Haynes & Engle 808,839
Overlay, C. W. Combs 809,095
Overshoe, A. E. Roberts 808,948
Packing, J. Ostrander 808,775
Pad. See Horseshoe pad.
Pantograph, N. H. Brown 809,246
Paper bag machine, F. E. Strasburg 809,230
Paper feeding machine, C. B. Stilwell.... 808,883
Paper machine head box, W. McNaught... 809,073
Pastry, hollow roll, F. Diener 809,100
Paving stones, manufacturing artificial, W. Schumacher 809,225
Peanut thresher, J. T. Delk 809,097
Pen, fountain, J. A. L. Snyder..... 808,880
Pencil holder, I. C. Reesor 809,135
Perforating machine, H. D. Jacobson..... 808,661
Petroleum, eliminating sulfur from the sulfur containing constituents of, H. S. Blackmore 809,087
Petroleum, extracting sulfur from the sulfur containing constituents of, H. S. Blackmore 809,086
Photographic plate and film lifter, J. J. Lintz 808,936
Photographs, apparatus for permitting the sucessive exhibition of, C. Fougerat.. 808,830
Piano actions, hammer supporting flange for, C. P. Blinn 809,042
Piano playing attachment, H. McPhaill ... 808,774
Piano swinging frames, regulating hinge for, Bretzfelder & Thumler 809,043
Pile driver, A. Bishop 809,242
Piling, metal, J. J. Harold 808,838, 808,985
Pipe cleaner, F. A. Falt 808,826
Pipe coupling, A. T. Herrick..... 808,922, 808,923
Pipe line, fluid, J. B. Speed 808,782
Pipe line, helically riffled fluid, Isaacs & Speed 808,752
Pipe tongs or wrench, E. Duggins 809,102
Pipe wrench, R. Adams 808,801
Pipe wrench, G. W. Waitt 809,152
Pivot gaging machine, D. H. Church..... 809,248
Plate press, Turner & Corley 809,036
Plow, W. Connor 808,727
Pneumatic tube carrier, B. C. Batcheller.. 808,623
Pneumatic tubes, combined door lock and indicator for carriers used in, P. J. Madigan 808,768
Potato digger, J. Hist 808,746, 809,259, 809,260
Power transmission device, G. W. Marble.. 808,769
Press, O. Smith 808,694
Pressure retainer, automatic, J. W. Brown 808,811
Printer's composing stick, F. M. Barker.. 808,715
Printer's register hook, J. E. Lee..... 808,663
Printing fabrics, Jeanmaire & Schmid.... 808,987
Printing, photomechanical multicolor, M. N. Weyl 809,157
Printing plate holder, E. R. Storm..... 809,229
Printing press bed and cylinder motion, M. J. Barnett 808,806
Printing press, flat bed web, H. F. Bechman 809,241
Printing press mechanism, J. J. Mosher.. 809,004
Propeller wheel, F. Chimzar 808,814
Propelling device, vessel, P. Carlson..... 808,634
Pulley, expansible, J. P. Brennan..... 809,169
Pulp screen, centrifugal, J. H. Baker, et al 809,041
Pulverous material, process and press for pressing, von Pelchrzim & Thummel.... 808,776
Pump, A. K. Miller 808,857
Pump, air, D. Mills 809,002
Pump, centrifugal turbine or similar, F. Ray 808,682
Punch and time stamp, combined, W. L. Lee 808,994
Punching machine, metal, G. C. Andrews.. 808,712
Race course starting gate, portable, M. Cassidy 808,813
Racking apparatus, Miller & Lawrence.... 808,941
Radiator, independent steam heat, W. Holstein 808,925
Rail and tie fastener, combination, F. M. Crossley 808,904
Rail joint, C. D. Peters 809,217
Rail joint, R. L. Alexander..... 809,238
Rail support, F. C. Painter 809,214



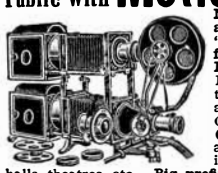
Quick Easy Money

can be made by becoming a magician or sleight-of-hand performer. I have, as a Society Entertainer, made as high as $600 a week. Under my direction I can show you how you, as a beginner, can make $50 per week. I have been teaching this art by mail for years. I do not teach toy tricks, but only tricks representing the highest type of the magician's art. As a **money-maker** and social accomplishment, the magician's art is incomparable. I will send you my book, **"Mysteries of Magic,"** free. Also, to convince you that my mail course is a success, I will send you a free trick. Write to-day.

THE ANSBACH CO.
Dept. 19 Hillsdale, N. J.

THE ANSBACH CO. is of international reputation. Capital $50.000.

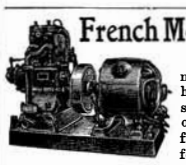
IT PAYS BIG To amuse the Public With Motion Pictures



NO EXPERIENCE NECESSARY as our instruction Book and "Business Guide" tells all. We furnish Complete Outfits with Big Advertising Posters, etc. Humorous dramas brimful of fun, travel, history, religion, temperance work and songs illustrated. One man can do it. **Astonishing Opportunity** in any locality for a man with a little money to show in churches, school houses, lodge halls, theatres, etc. **Big profits each entertainment.** Others do it, why not you? It's easy; write to us and we'll tell you how. **Catalogue free.**
AMUSEMENT SUPPLY CO., 467 Chemical Bank Bldg., CHICAGO.

They Make Bad Roads Good

No slipping or skidding of wheels on any kind of conveyance if fitted with
WEED'S TIRE GRIPS
which ensure steady traveling. Can be carried in any car. Occupy but little space. Easily adjusted. Anyone can apply them. Protects occupants of car from flying mud etc. Indispensable in wet weather. Send for free descriptive booklet S.
WEED CHAIN TIRE GRIP CO., 28 Moore St., N. Y. City

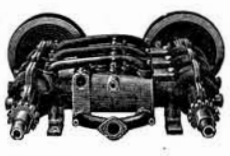


French Motors for Lighting Plants

The **"ASTER"** is the best French motor on the market for lighting houses, hotels, etc. Small, compact, simple and safe to operate. Motive power alcohol, oil or gas. 2 and 4 cylinders. Great power for small engines. Easy running. Write for illustrated Price List.

ASTER COMPANY
1591 Broadway NEW YORK CITY

The Most Modern Marine Motor



having the most rapid speed and weighing least per h. p. and possessing the fewest parts is the **Van Auken Motor.** No vibration, easy to operate, simple, reliable, clean. Great power. Perfect control. Always ready. Every stroke cleans the cylinder.
VAN AUKEN-CLEVAUC CO. Yonkers, N. Y., U. S. A.

WILLIAMS' SHAVING STICK

"The Shaver's Joy."

Creamy—comforting.

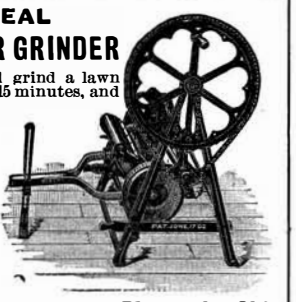
Williams' Shaving Sticks, Shaving Tablets, Toilet Waters, Talcum Powder, Jersey Cream Toilet Soap, etc., sold everywhere

Write for booklet "How to Shave"

THE J. B. WILLIAMS CO.
GLASTONBURY, CONN.

THE IDEAL LAWN MOWER GRINDER

This machine will grind a lawn mower perfectly in 15 minutes, and is destined to revolutionize the whole business. Greatly improved over old models, and is now perfection. Energetic men and boys make $10 per day using it. Nothing like it on the market.
For prices, etc., address the manufacturers.



THE ROOT BROS. CO., Plymouth, Ohio

THE EUREKA CLIP

The most useful article ever invented for the purpose. Indispensable to Lawyers, Editors, Students, Bankers, Insurance Companies and business men generally. Book marker and paper clip. Does not mutilate the paper. Can be used repeatedly. In boxes of 100 for 25c. To be had of all booksellers, stationers and notion dealers, or by mail on receipt of price. Sample card, by mail, free. Manufactured by **Consolidated Safety Pin Co.,** Box 121, **Bloomfield, N. J.**

Size No. 2.

WARREN'S NATURAL ASPHALT SAND SURFACED ROOFING

Apply it yourself. Makes a finished gravel roof. Comes ready to lay in rolls of 108 square feet. Write for sample, circular and prices. **Warren Chemical and Mfg. Co., 18 Battery Pl., New York**

DO YOU USE GRINDSTONES?

If so we can supply you. All sizes **mounted and unmounted,** always kept in stock. Remember, we make a specialty of selecting stones for all special purposes. *Send for catalogue "I"*
The CLEVELAND STONE CO.
2d Floor, Wilshire, Cleveland, O.

$3.00 A YEAR

AMERICAN HOMES AND GARDENS
MUNN & CO.
SCIENTIFIC AMERICAN OFFICE
361 Broadway, New York
NEW SERIES OF SCIENTIFIC AMERICAN BUILDING MONTHLY

July, 1905, Cover

PUBLISHERS' NOTICE

American Homes and Gardens

PUBLISHERS' NOTICE

$3.00 a year; or, with the SCIENTIFIC AMERICAN, $5.00 a year.
Measures 10½ x 14 inches. 72 Pages. Colored Cover.

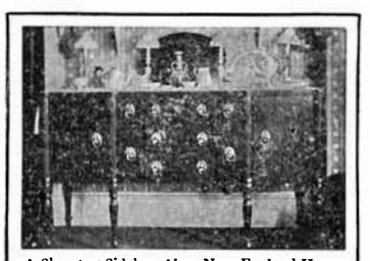
¶ This is a thoroughly practical magazine, dealing with the home and its surroundings. An ideal journal dealing not only with buildings but with country life as well. The aim of the magazine has been to stimulate among its readers a wider interest in the beautifying of the home. The articles deal with not only the house exterior but the interior plans and arrangements and the subject of decoration as well. The garden, as an adjunct or frame of the mansion, receives its full share of attention, and each issue contains examples of artistically planned gardens, large and small, old and new. There will be published in each issue some large estate, and the reader will be taken over the buildings and grounds as a visitor. There will also be published articles dealing with all phases of practical country life.

$3.00 A YEAR

January, 1906, Cover

DURING 1906 ARTICLES WILL BE PUBLISHED SHOWING

How curtains may be made at home;
How furniture may be covered by the woman of the house;
How the amateur may decorate the room with home-made stencils;
How a water garden may be laid out and built;
The use of statuary for garden decoration.



A Sheraton Sideboard in a New England Home

A MINIATURE ENGRAVING

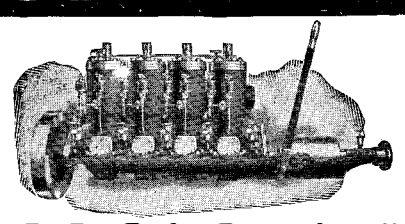
ALSO DURING 1906 ARTICLES WILL BE PUBLISHED ON

The kitchen and how it should be planned (a series);
Historical places in America;
The house of the Colonial period;
Gateways to estates;
How the house of a bygone day may be remodeled and converted into a modern home.

¶ The magazine is beautifully printed on heavy coated paper, and is elaborately illustrated by handsome engravings made from photographs taken especially for this publication. The colored covers change monthly (see reduced black and white specimens above). AMERICAN HOMES AND GARDENS should have a place in every home. Send $3.00 to-day and receive the beautiful November and December issues without charge. Single copies, 25 cents, postpaid, or they can be obtained from any newsstand.

MUNN & COMPANY, Publishers, SCIENTIFIC AMERICAN OFFICE, 361 BROADWAY, NEW YORK

SMALLEY
MARINE GAS ENGINES



"It Is Self Starting"

INDIAN RIVER, MICH., October 14, 1905.

SMALLEY MOTOR CO., Bay City, Mich.

Gentlemen—You can refer anyone to me in regard to th Smalley motor; my motor runs perfectly. There is one thing about your motor that you do not mention—IT IS SELF STARTING. My motor starts just as sure as steam if it has not stood over ten hours; if it has I only have to turn the flywheel back one-quarter turn in the morning, but that is all for the day. Your rotary timer starts the engine every time. I don't think you mention this in your catalogue, but for a perfect motor it can't be beat. Yours truly, CAPT. WM. F. DAGWELL.

BAY CITY, MICH., June 10, 1905.

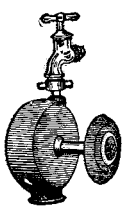
SMALLEY MOTOR CO., Bay City, Mich.

Gentlemen—After using the 12 H. P. engine I am pleased to report to you that the engine has proved far beyond my expectations. In all my use of the engine I have never known it to miss an explosion. I have kept actual count of twenty-seven times I have started engine after having made stops at various points along the river and in twenty-six of these twenty-seven times I have never used either starting lever or turned a wheel, simply starting engine by means of the commutator. IT IS SELF-STARTING. Yours very truly, CHAS. CORYELL.

Send 10 cents in stamps for complete illustrated catalogue Address Dept. W.

SMALLEY MOTOR CO., LTD., Bay City, Mich., U. S. A.
Member of the National Ass'n of Engine and Boat Mnfrs.

$5.00 Water Motor $3.50



Morton's $5 Divine Faucet Water Motor for a limited time $3.50, complete. Guaranteed. Attached to any faucet. For polishing, sharpening and grinding. Runs all kinds of light machines like washing and sewing machines. Largest and most powerful water motor. Outfit includes emery wheel, buffing wheel, wooden pulley, and polishing material. Money refunded if not satisfactory—none C.O.D. Order now, or write immediately for free booklet.

MORTON MFG. COMPANY, Dept. C,
130 Fulton Street, New York.

Let Me Sell YOUR PATENT

Booklet explaining how mailed **FREE.** Fifteen years' experience Patent Sales exclusively. If you have a **Patent** for sale, call on or write

WILLIAM E. HOYT
Patent Sales Specialist
290 O, Broadway, N. Y. City

SENSITIVE LABORATORY BALANCE.

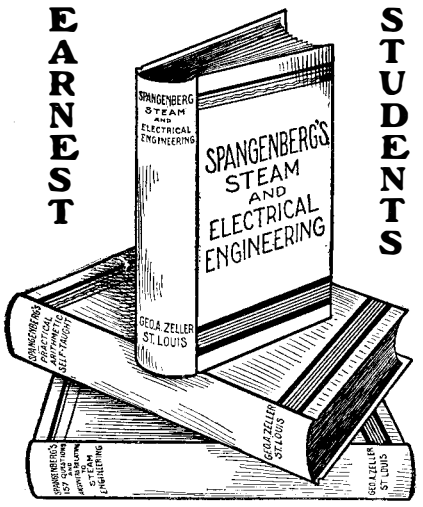
By N. Monroe Hopkins. This "built-up" laboratory balance will weigh up to one pound and will turn with a quarter of a postage stamp. The balance can be made by any amateur skilled in the use of tools, and it will work as well as a $125 balance. The article is accompanied by detailed working drawings showing various stages of the work. This article is contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1184.** Price 10 cents For sale by MUNN & Co., 361 Broadway, New York City, or any bookseller or newsdealer.

WELL DRILLING Machines

Over 70 sizes and styles, for drilling either deep or shallow wells in any kind of soil or rock. Mounted on wheels or on sills. With engines or horse powers. Strong, simple and durable. Any mechanic can operate them easily. Send for catalog.

WILLIAMS BROS., Ithaca, N. Y.

EARNEST STUDENTS



If You Are in Earnest in the study of Engineering you want practical, clear, and reliable books on the subject. **Spangenberg's Steam and Electrical Engineering** exactly answers your purpose. Written by practical engineers, and written so you can understand it. Price, $3.50. See coupon below.

The Biginner in Steam Engineering wants answers to his questions relating to first principles, and these he finds in **Spangenberg's 157 questions and answers relating to steam engineering,** a 192 page book intended for beginners only. Price, 75 cents See coupon below.

To the boy or man whose ignorance of Arithmetic, from whatever cause, prevents his advancement, **Spangenberg's Practical Arithmetic, Self-Taught,** supplies in easily understood form the instruction he has previously missed. With no other teacher the learner is fitted to make the calculations and solve the problems required in industrial pursuits and trades. Price, 60 cents. See coupon below.

SPECIAL OFFER The above three books sent postpaid on receipt of $4.00, or in accordance with agreement set forth on coupon below. If the books are not perfectly satisfactory return them within ten days and get your money back.

COUPON. Cut out and mail to-day.

GEO. A. ZELLER BOOK CO., 1 S. Fourth St., St. Louis, Mo.

I accept your offer to send me, express prepaid, the above three books, price $4.50, and enclose $2.50 as first payment. The balance, $2.00, I agree to remit in 50 cent monthly installments, money, express order, or stamps.

Name.....

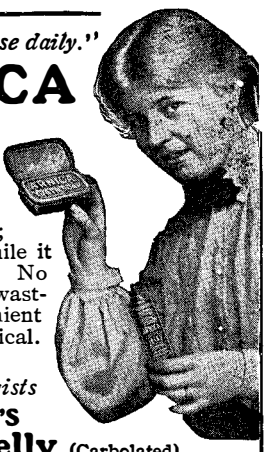
Street or Box No.....

City and State.....

Rails, anticreeping device for, J. J. O. Fischer	808,648	
Railway crossing, automatic safety, T. Squires	809,028	
Railway, electric, C. Levinson	809,120	
Railway rail joint, E. B. Verneuil	808,705	
Railway rail stay, T. D. Henderson	808,921	
Railway, surface contact electric, G. H. McFeaters	808,773	
Railway switch, automatic, J. M. Faulk	808,827	
Railway tie and means for securing rails thereto, metallic, F. G. Metcalf	809,000	
Railways, anticreeper for, J. G. Sullivan	808,952	
Ratchet mechanism, M. Reisch	808,946	
Razor guard, Schreiber & Klier	809,224	
Razor holder and handle, safety, C. L. Holland	808,659	
Razor strop, O. & F. Kampfe	809,114	
Regenerative furnace, Siemens, A. Kurzwernhart	809,067	
Relay, C. L. Goodrum	808,834	
Rifle, magazine, W. E. Clay	809,094	
Ring. See Collector ring.		
Rivet holder, R. J. Gordon	808,835	
Road leveling machine, C. D. Smith	808,877	
Rock and coal drill, L. C. Hardsocg	808,837	
Roll removing device, C. W. Bray	808,719	
Rope, C. H. Billman	808,895	
Rope carrier, fall, E. K. Young	808,710	
Rope clamp, J. J. Clark	808,970	
Rope drive adjusting mechanism, R. H. Stevens	808,699	
Rotary engine, A. Hager	809,054	
Rotary engine, D. B. Stalker	809,149	
Rotary engine, H. A. Fredlund	809,180	
Rough rounding and channeling machine, W. S. Brainerd	808,628	
Sad iron polishing machine, O. Tverdahl	808,786	
Saddle, riding, P. H. Fontaine	809,179	
Sash lock, C. B. Conant	808,815	
Saw for manufacturing lumber, gang, G. B. Miller	808,671	
Saw table cutting gage, C. Von Culin	808,889	
Scale, coin controlled, J. Lorentzen	809,198	
Scale for accurate lard weighing, electric, C. E. Snypp	809,026	
Scraper, self-loading, H. F. Purdum	808,870	
Seal, bottle, A. E. Prier	809,011	
Sealing bottles, means for, F. M. Osgood	809,213	
Sealing mechanism, bottle, E. Goltstein	808,833	
Semaphore mechanism, B. O. Wagner	809,237	
Sewing machine attachment, fur, C. B. Johnsen	809,265	
Sewing machine buttonhole attachment, F. J. Freda	808,914	
Sewing machine cabinet, G. Baurmann	809,240	
Sewing machine implement holder, M. J. Davis	808,639	
Shade roller, window, J. Renner	809,221	
Shade roller, L. T. Bulley	808,722	
Shades, spring roller for window, H. R. Derby	809,098	
Sharpener, shaper, and gager, drill, J. T. Thompson	808,886	
Sheet metal building structure, T. Lee	808,664	
Shoe polishing stand, P. H. Hixon	808,986	
Shoe rack, E. F. White	808,794	
Show or display case, G. E. Clapp	808,726	
Shredder feeder, G. W. Crane	808,972	
Shuttle brake, J. Laforet, reissue	12,428	
Siding, manufacturing, C. Loetscher	808,998	
Sifter, flour, E. T. Farmer	809,178	
Sign changing letter, automatic, Thomas & Jenkins	808,884	
Signal, Stanford & Colpitt	809,029	
Signaling apparatus, J. T. Hambay	808,984	
Skate, W. H. Dunne	809,103	
Skylight, J. Dugenhardt, reissue	12,432	
Slaughter house travelers, tracking device for, C. E. De Moss	808,819	
Sled brake, automatic, B. M. Weberg	809,155	
Small arm magazine, P. Mauser	808,938	
Smoke consumer, J. R. Gormley, et al	808,917	
Smoke consumer, G. M. Boone	809,168	
Smoke flue and ventilating device, combined, C. C. Roth	809,223	
Sole fastener, shoe, W. Beck	808,807	
Sound record tablet, Hoyt & Gaven	809,263	
Sound records, manufacture of, Hoyt & Gaven	808,842, 808,843	
Sparking ignition system, L. J. Le Pontois	809,268	
Spectacle frames, manufacturing, W. A. Coates	808,899	
Spectacles, protector for, C. E. Linnig	809,194	
Spike puller, L. A. Milligan	809,122	
Spool cabinet, J. A. Epley	809,274	
Spoon, measuring, W. H. Arrowsmith	808,967	
Spoon, medicine, W. L. Jerkins	808,845	
Spraying apparatus, A. M. Cobb	809,045	
Spring end, G. H. Channell	809,173	
Sprinkling machine, W. A. Collins	809,046	
Staging, portable, T. H. Kingston	808,989	
Stamp, T. S. Buck	808,812	
Stamp, adjustable time limit, W. L. Lee	808,993	
Stamping device, roller, W. Scott	809,018	
Stamping device, tag, C. C. King	809,188	
Standard, G. W. Du Bes	808,907	
Standard, pocketless, G. W. Du Bes	808,733	
Station indicator, R. F. Le Brocq	809,267	
Steam, etc., device for circulating, F. C. Goff	809,253	
Steam from hot slag, apparatus for generating, G. Mitchell	809,123	
Steam generator, slag, G. Mitchell	809,204	
Steam separator and automatic shut off, Streeper & Oelenschlager	808,701	
Steering device, A. T. Brown	809,171	
Steering device, boat, A. B. McCoy	809,072	
Stitching machine, buttonhole, W. E. Goodyear	809,052	
Stoker, mechanical, Mansfield & Felton	809,202	
Stone walks, tool for making artificial, P. F. Connelly	808,900	
Straightening table, S. V. Huber	808,751	
Strainer, milk, A. A. C. Klint	809,115	
Studding, metallic, F. Voss	808,789	
Stump puller, W. Smith	808,879	
Switch setting apparatus and electric rail heater, electromagnetic, B. O. Wagner	809,236	
Swivel, F. W. Seidl	809,020	
Table and folding bed, combined, C. P. Davies	808,818	
Tablet board, C. B. Macfarlane	808,669	
Tank indicator, Rahm & May	808,871	
Tap, current, W. D. Harris	809,183	
Telegraph key, A. E. Peterman	808,777	
Telegraphic keyboard apparatus, P. B. Delany	808,642	
Telegraphy, wireless, P. B. Delany	808,641	
Telephone exchange system, semi-automatic, A. T. M. Thomson	809,232	
Telephone holder, L. S. Hallowell	808,983	
Telephone signaling apparatus, K. H. Poyas	808,868	
Telephone system, H. A. Judge	809,186	
Telephones and the like, ringer for, E. R. Hobbs	809,060	
Temperature regulating means, W. Wadsworth	808,707	
Thill coupling, C. Vives-Navarro	809,079	
Ticket holder, N. A. Plancich	809,132	
Tie liner and spacer, W. T. Pace	809,008	
Tire protector, pneumatic, H. David	808,974	
Tires, non-skidding device for, C. R. Bullard	808,721	
Tool clamp, hydraulic, R. D. Fildes	808,647	
Tool, combination, La Duke & O'Harra	809,191	
Tool holder, C. L. Goodrich	808,981	
Tool holder, B. M. W. Hanson	809,257	
Toothpicks, apparatus for the manufacture of, H. S. Hopper	808,841	
Top, J. W. Grattan	808,918	
Torpedo guard, marine, J. Neumaier	808,942	
Toy, F. W. Carpenter	809,092	
Toy, I. N. Phipps	809,270	
Toy pistol, F. M. Ball	808,621	
Toy pistol, L. H. Hinaman	809,059	
Track sanding apparatus, F. W. Wittkowski	808,797	
Traction engine, L. O. & F. B. Smith	808,878	
Traction engine, M. W. Kouns	809,189	
Traction wheel, Lafever & Gregory	809,266	
Trailing fender, E. G. Solomon	808,783	
Trains, sewerage system for, Mettenheimer & Herblin	809,070	
Transformer, J. J. Frank	808,740	
Transformer, regulating, H. J. Blakeslee	808,718	
Trap, C. Spinler	809,148	
Trestle, combination adjustable, J. W. Meisel	808,940	
Trolley device, F. J. Ludolph	808,852	

"These two I use daily."

ARNICA Tooth Soap



Is antiseptic; preserves while it beautifies. No spilling or wasting; convenient and economical.

25 Cents
At all Druggists

STRONG'S
Arnica Jelly (Carbolated)

Keeps the skin free from roughness and pimples. Nothing better for sunburn or chapping; also for cuts, bruises, burns and all eruptions. Keeps the skin soft, smooth and delicate. The collapsable metal tube is convenient and unbreakable.

Take it with you wherever you go. If your druggist hasn't it—Send to us.

Sent postpaid on receipt of 25 cents.

C. H. STRONG & CO.
CHICAGO

KLIP-KLIP

"DUO"
MANICURE-
CIGAR CUTTER

A blade for each purpose.

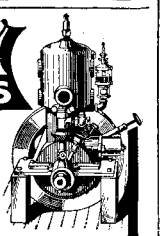
25c By Mail
Worth its weight in gold

A Perfect manicure. A Sanitary Cigar Cutter.

Klip-Klip "Duo" (two in one) has a sharp steel clip, file and cleaner. Keeps the nails in perfect condition. Also a separate blade which cuts cigars quick and clean. It is sanitary. Physicians say everyone should use his own cigar cutter. It is light, compact and handsomely finished and sells at sight. Two combined for one price. At all dealers or mailed upon receipt of 25c. The "original" German silver Klip-Klip (manicure only)–same price. Your money back if you want it.

MANUFACTURED ONLY BY THE
KLIP-KLIP COMPANY
556 Clinton Ave., S., Rochester, N. Y.

Leader MARINE ENGINES



Are the most symmetrical in design, accurately constructed of any marine engine made.

The designer of "Leader Engines" has had 20 years of ACTUAL PRACTICAL experience in building automobile and marine engines—each part of every engine is made under his personal supervision—A STRONG DURABLE Engine with all parts absolutely INTERCHANGEABLE.

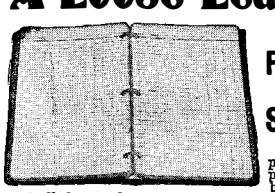
$75.00 1 1-2 H. P., F. O. B. cars Grand Rapids.

The lowest priced engine made—and will develop double the rated H. P.

Write for our new catalogue—MAILED FREE. It explains gas engines more thoroughly than any other and tells why we can make a good engine at a small price.

CLAUDE SINTZ, Manufacturer
292 So. Front Street GRAND RAPIDS, MICH.

A Loose Leaf Book



PERFECTLY
Flat-Opening
AND
Self-Indexing

Most convenient for price books, route books, pocket ledgers, meter books, engagement books and all forms of records which should be kept in convenient, accessible form. Better than any card index. These **"Unimatic"** books are bound in full, genuine, flexible, black leather, are **perfectly flat opening and sheets may be instantly inserted or removed from any part.**

The following sizes sent postpaid on receipt of price:

USE	No.	BINDING EDGE	SIZE OF SHEET	CAPAC. OF COVER INCHES	CAPAC. OF COVER LEAVES	COMPLETE
Vest Pocket	212	2	2 x 4	1/4	50	$0.85
" "	4412	4 1/2	4 1/2 x 2 1/2	1/4	50	.95
Coat Pocket	612	6	6 x 3 1/2	1/4	50	1.20
" "	532	5 1/2	5 1/2 x 3	1/2	125	1.70
" "	632	6 1/2	6 1/2 x 3 3/4	1/2	125	1.75
" "	7732	7 7/8	7 7/8 x 4 1/2	1/2	125	2.10
Desk	1132	11	11 x 8 1/2	1/2	125	3.90

19 other sizes carried in stock

Stock ruling: Quadrille, Unruled, Dollars and Cents, Faint Lines, Double Entry Ledger and 4-Column Price-Book Ruling.

Send for sample sheets and complete catalogue of largest line of loose-leaf devices in the world.

Sieber & Trussell Mfg. Co., 4002 Laclede Ave., St. Louis

$80 to $175 Per Month

For Firemen and Brakemen, experience unnecessary. Instructions by mail at your home. High wages guaranteed; rapid promotion. We assist you in securing a position soon as competent. Send today. Full particulars at once. Inclose stamp.

National Railway Training School, Inc.
Room 636 Boston Blk, Minneapolis, Minn

HAIR

Our Guarantee Backed by the Bank

We will send you by prepaid express, an Evans Vacuum Cap, to use sixty days, and if you do not cultivate a sufficient growth of hair within this time to convince you that this method is effective, simply notify the Jefferson Bank of St. Louis, and they will return the price of the Cap to you.

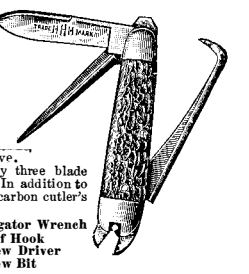
The Cap is used a few minutes each day, and even one application produces a pleasant, tingling sensation, which denotes the presence of new life in the scalp and which cannot be obtained by any other means. Where the life principle has not become extinct, this method of stimulation will usually develop a growth of hair about an inch in length, within the trial period.

A series of letters from a number of people, giving their experience with the Evans Vacuum Cap, appears in this month's "Metropolitan" and "Everybody's" magazine, and we will send copy of these letters, together with an illustrated book, to anyone interested.

We have no agents or traveling representatives. All orders for our invention come through the Jefferson Bank and each customer is protected by guarantee issued by the Bank. For further information address

EVANS VACUUM CAP CO.
112 Fullerton Bldg., St. Louis, Mo.

You need this knife on your automobile, in the shop and in your home.



A Veritable Pocket Tool Chest

— 9 TOOLS IN 1 —

The Wonder of the Age

Built as substantially as a locomotive. Weighs no more than an ordinary three blade pocket knife. Stag horn handle. In addition to the blade, which is made from 85 carbon cutler's steel, contains the following tools:

1, Leather Punch	5, Alligator Wrench
2, Sweeging Awl	6, Hoof Hook
3, Wire Cutter	7, Screw Driver
4, Wire Pliers	8, Screw Bit

Cuts barbed fence wire as easily as an ordinary 8-inch plier. Hoof hook is of great value as a packing hook around the engine. The tools are needed almost every day, and in tinkering around your home the knife will be an invaluable pocket companion. **AGENTS WANTED**

Remit $1.25 for sample to-day. Your money back if not satisfied.

This Knife for an Inventor or in a Model Shop is a Genuine Luxury

DEVINE SPECIALTY CO.
88 Baldwin Building INDIANAPOLIS, IND.
REFERENCE: Columbia National Bank.

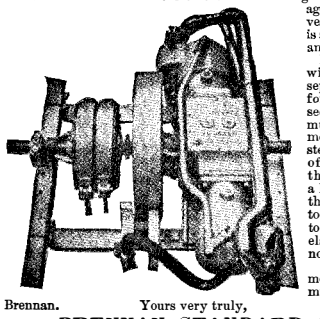
CLINTON, MICH., Dec. 21, 1905.

BRENNAN MOTOR CO., Syracuse, N. Y.

GENTLEMEN:—The 20 H. P. Motor I bought of you three years ago, to run my ice harvester, is a dandy. It is simple, easy to control and cheap as to fuel.

I did my threshing with it, running a large separator, with blower for stacking, and it seemed to run with as much power, than the large steam engine. Crowds of people came to see the little thing run such a large machine and do the work so easily. It took about three hours to thresh over 400 bushels of grain and we did not stop once.

Any one wanting a motor will make no mistake if they get a Brennan.



Yours very truly,
J. B. HAUSE.

BRENNAN STANDARD MOTOR

Mounted with Individual Clutch Gear, also Furnish Sliding Gear Transmissson.

Motors from 6 to 80 Horse Power.

GAS ENGINE DETAILS.—A VALUA-

ble and fully illustrated article on this subject is contained in SUPPLEMENT No. **1292.** Price 10 cents. For sale by Munn & Co. and all newsdealers.

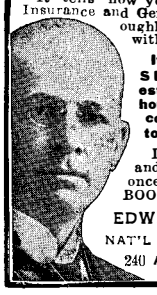
YOU CAN MAKE FROM $300.00 TO $500.00 A MONTH IN THE REAL ESTATE BUSINESS

Send for my FREE BOOK

THIS valuable book offers an unusual opportunity for men without capital to become independent for life.

It tells how I have helped hundreds of inexperienced men to immediate and permanent success.

It tells how you can learn the Real Estate, Insurance and General Brokerage Business thoroughly by mail without interfering with your present occupation.



It tells how we appoint you our SPECIAL REPRESENTATIVE, establish you in a pleasant, honorable business of your own, co-operate with and assist you to make a large, steady income.

If you are honest, ambitious and willing to work, write me at once. Just say: "SEND FREE BOOK." Address

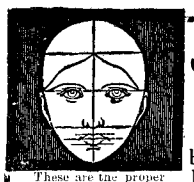
EDWIN R. MARDEN, PRES'T
NAT'L CO-OPERATIVE REALTY CO.
240 ATHENAEUM BLDG., CHICAGO

The "Kant-Klog" Sprayer

Something New. Gets twice the results with same labor and fluid. All sizes. Flat or round spray from same nozzle. For trees, vines, vegetables, whitewashing, disinfecting, wagons, fire, etc., etc.

Agents Wanted.
Circular free.

Rochester Spray Pump Co., 300 East Ave., Rochester, N. Y.



These are the proper proportions of a face. Did you realize it?

$1.00 For a Complete Art Education

The offer already accepted by 20,000 delighted people. Just take a minute to read what we offer at this unheard-of price and then send for it.

Splendidly illustrated. Thorough, practical, complete. By Chas Hope Provost, contributor to leading publications and originator of correspondence art instruction.

CONTENTS

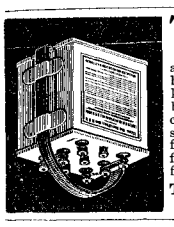
TECHNIC—Working with pen, brush (oil and water color), pastel, grease and conte crayon, lead pencil, carbon pencil, scratch paper, chalk plate, Ben Day machine, silver print work. Also the various effects used by pen artists, including quick and slow lines, English and American styles of treating zig-zag lines, hooked lines, quick lines, double cross hatching, stippling, spatter work, etc. Wash drawings. Distemper Drawings. Tracing and copying photographs What materials to use, including papers, canvases, and bristol boards. Tools and how to handle them. Drawing from nature, including landscape, flowers, animals, figures, portraits, etc. Drawing from memory, with table showing comparative measurements of different parts of he human body—head, hands, feet, legs, arms, etc. COLOR—primary and secondary colors, etc., explained. How to mix different shades, etc. ARTISTIC ANATOMY—The bones and muscles as applied to pictorial work. LETTERING—Copying and originating. Roman, block, old English, and Script styles shown. Elementary, historic, and geometric ornament. Conventionalization of flowers, ornamental composition, pictorial composition (including form and color arrangement and balance), fashion work, caricaturing, cartooning. FACIAL EXPRESSION—Sorrow, joy, anger, fear, contempt, laughter. Aerial and linear perspective. BUSINESS DETAILS—How to sell pictures, how to get a position as an artist, prices and salaries paid, lists of names of publishers and others who buy work, how to pack pictures to send by mail or express, etc. Explanations of various engraving and reproductive processes.

"How to Illustrate" sent prepaid to any address in the world for $1.00. (Limp. Covers.)

A more handsomely bound edition in cloth covers, $1.50 prepaid.

Remit to-day, as this offer may be withdrawn at any time, or send 2c. stamp for booklet.

BROWN PUBLISHING CO.
1635 Flatiron Building, New York



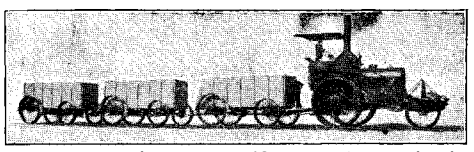
Turn It Upside Down

and it won't spill. The only non-liquid storage battery on the market and the only one of its kind in the world. Impossibility for plates to bend or short-circuit, as electrolyte is of solid consistency. Can be recharged like the wet storage battery as often as desired. Suitable for every gas and gasoline ignition. Shipped fully charged to any part of the world. Write for descriptive pamphlet and trade prices.

THE ROYAL BATTERY CO.
143 Chambers St., New York City

RUBBER STAMP MAKING.—THIS article describes a simple method of making rubber stamps with inexpensive apparatus. A thoroughly practical article written by an amateur who has had experience in rubber stamp making. One illustration. Contained in SUPPLEMENT 1110. Price 10 cents. For sale by Munn & Co. and all newsdealers.

Road Freighting Traction Engines



Over 200 in use on Pacific Coast alone. Siberia, Spain, India, Central America, Sandwich Islands have them.

Engines 110 Horse-power. Wood, Coal, or Oil burning. Hauls 50 tons, takes grades 5 to 25 per cent. Capacity each car 16 tons.

THE BEST MFG. COMPANY
San Leandro, California

Cable Address, DANBEST. Codes, Western Union and McNiel. *Write for our New Catalogue No. 18*

Principles of Home Decoration

BY

JOY WHEELER DOW

A Series of Monthly Papers in

American Homes and Gardens

MR. DOW is contributing to AMERICAN HOMES AND GARDENS a series of monthly papers on interior household decoration, under the comprehensive title of "Principles of Home Decoration."

The papers are richly illustrated and are written in the keenly critical spirit for which Mr. Dow is well known. They admirably summarize the whole subject of household decoration, and abound with admirable hints and suggestions. The photographs published with the articles are supposed to emphasize some principle of decoration, showing what is admirable and what is to be carefully avoided.

The July issue was a general introduction of the subject, together with examples of one or two typical English living rooms. The August issue treats of the subject of Halls. Subjects to follow will relate to the Dining Room, the Drawing Room, etc.

Every one who is interested in home decoration will be interested in and receive valuable suggestions from this series by Mr. Dow.

American Homes and Gardens

PUBLISHED BY

MUNN & COMPANY

361 Broadway, New York

25 cents per Copy. $3 per Year

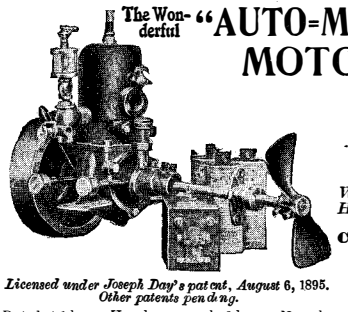
Truck, H. Weber, reissue	12,430
Truck, collapsible, C. E. Fischer	808,738
Trunk, M. E. Morgan	809,124
Truss, M. B. Smyth	808,697
Tube drawing apparatus, G. Baehr	808,620
Turbine, C. E. Smith	809,147
Turbine engine, E. J. Wood	808,709
Turbine engine, H. Scheele	808,950
Turnbuckle, J. A. Steinmetz	809,030
Typewriting machine, H. L. Arnold	808,714
Typewriting machine, H. W. Merritt	808,771
Typewriting machine, C. H. Shepard	808,875
Umbrella, M. G. McGuire	808,863
Updraft kiln, E. A. King	808,847
Valve, E. E. Hartgrave	808,654
Valve and faucet reseating device, A. Eberlein	808,912
Valve for hydrant pipes, drain, F. A. Jacobs	809,063
Valve mechanism, J. M. & E. W. Raikes	809,012
Vapor electric apparatus, A. M. Jackson	808,753
Vault lights, floors, etc., bracing for, J. Jacobs	808,660
Vehicle, J. T. Furchtbar	809,048
Vehicle cover, W. Findlay	808,828
Vehicle, dumping, S. C. Lancaster	808,991
Vehicle repairing device, C. W. Lavers	809192
Vehicle wheel, M. G. Babio	809,040
Vehicle wheel, G. D. Munsing	809,205
Veneer cutting machine, J. J. Russell	809,136
Ventilator. See Window ventilator.	
Vessel, marine, J. E. Johnson	809,064
Violin bridge, F. L. Davis	809,174
Vise, F. M. Stambaugh	809,271
Vise slide, E. M. Walker	808,960
Wagon brake, automatic, E. F. Veatch	809,151
Wagon, dumping, G. W. Crane	808,973
Wagon spindle, A. J. Beliel	809,166
Wagons, front bolster and body support for children's, O. P. Erard	808,977
Wall mold, J. H. Gehr	809,106
Wardrobe hook, B. Z. Schreyer	809,017
Washbowl valve, D. W. York	809,161
Washtub attachment, M. W. Story	808,702
Watch, stop, A. C. Loker	809,196
Water closet, C. H. Rollins	809,222
Water cooler, G. E. Savage	808,692, 808,781
Water heater and pressure reservoir, combined, F. L. Rice	808,947
Water supply system, automatic, J. Johnson	808,662
Wave motor, C. A. Sahlberg	806,688
Weaving, L. Lemieux	809,118
Welding apparatus, socket, D. Heggie	808,657
Well pulling machine, Kraft & Fetzer	809,190
Welt making machine, G. E. Rollins, reissue	12,429
Wheel structure, J. Ledwinka	808,765
Wheels, construction of, T. R. Beaumont	808,625
Windlass, T. F. Mason	808,670
Windmill, M. S. Newcomer	809,208
Window platform, collapsible, E. G. Raff	808,681
Window screen, Smith & Sweet	808,695
Window screen fastening, B. C. Rockwell	808,686
Window ventilator, A. A. Stephens	809,228
Windows, air stop for, Davis & Samelius	808,640
Wire carrier, F. L. Sessions	809,226
Wire stretcher, D. K. Kirkland	808,759
Wire stretcher, Z. A. Curtis	809,096
Wireless and other transmissions, receiver and recorder for, F. E. Gallagher	808,832
Wood conveyer, G. G. Hughs	808,926
Woven fabric, T. B. Dornan	808,976
Wrapper transferring mechanism, Herrington & Knight	808,745
Wrappers to magazines, books, and the like, machine for applying, B. W. Tucker	808,956
Wrench, H. T. Thompson	808,954

DESIGNS.

Ash tray, A. Q. Walsh	37,770
Automobile body, Thomas & Koen	37,774
Belt, D. Hirschberg	37,776
Bracelet, C. S. Hurd	37,767
Cradle, souvenir, C. C. Boykin	37,768
Finger ring, J. L. Herzog	37,766
Lamp, I. H. Atwood	37,772
Lamp, vehicle, E. C. Everett	37,773
Padlock, A. W. Douglas	37,771
Paper, wrapping, F. O. Walther	37,775
Spoon or fork, C. A. Bennett	37,769

TRADE MARKS

Absorbent pads or plasters, G. C. Young	48,494
Adhesive tape or cloth, Okonite Co	48,515
Base balls, C. Disch	48,521
Beer, Gottfried Brewing Co	48,497
Beer, Indianapolis Brewing Co.	48,512, 48,513
Beer, San Diego Brewing Co	48,517
Beer, Theo. Hamm Brewing Co	48,568
Beer, lager, C. Schmidt and Sons Brewing Co.	48,496
Beverages, non-alcoholic, J. W. Birkhead	48,572
Biscuits, crackers, etc., French & Co	48,456
Bitters, Ullman Einstein Co	48,607
Boots and shoes and leather for the same, leather, F. G. Jones	48,498
Boots and shoes, leather, Geo. D. Witt Shoe Co.	48,477
Boots and shoes, leather, Wingo, Ellett & Crump	48,490
Boots and shoes, leather, Hinkle Shoe Co	48,499
Boots and shoes, leather, John W. Russ Co.	48,500
Bottles, nursing, W. M. Decker	48,455
Candy, Reymer & Brothers	48,526
Candy, Chandler and Rudd Co.	48,599
Canned fruits and vegetables, Scudders-Gale Grocer Co.	48,465
Cards, playing, New York Consolidated Card Co.	48,531, 48,532, 48,561 to 48,564
Cards, playing, United States Playing Card Co.	48,565, 48,566
Cement, Eclipse Cement & Blacking Co	48,475
Cement, Portland, natural rock, and improved, American Cement Co.	48,470
Chocolates and bonbons, R. L. Perry Co	48,511
Cider, bottled, S. S. Pierce Co.	48,528
Cigarettes, H. P. Strause	48,485
Coats, pants, overalls, and blouses, Larned, Carter & Co.	48,481
Cocktails, Charles Jacquin et Cie	48,574
Cognac, S. Hochstadter	48,582
Cotton Piece Goods, Massachusetts Cotton Mills	48,484, 48,503
Cough syrup, Foster Milburn Co	48,522
Crochet quilts, Union Manufacturing Co	48,488
Cure of cancers and kindred diseases, preparation for the, D. R. Dupuis	48,542
Fertilizers, Federal Chemical Co	48,476
Flavoring extracts, Crescent Manufacturing Co.	48,449
Flour, wheat, Northwestern Consolidated Milling Co.	48,462, 48,464
Flour, wheat, G. A. Zabriskie	48,469
Garters, men's, L. Oppenheimer's Sons	48,508
Gin, Chicago Distilling Co	48,576
Gin, C. H. Graves & Sons	48,579
Gin, A. M. Young	48,612
Gin, sloe, Charles Jacquin et Cie	48,573
Gloves, Wertheimer & Co	48,535
Guitars and mandolins, Lyon & Healy	48,483
Hair and scalp, compounds for the treatment of the, N. von Feldman	48,534
Hair clippers, Brown & Sharpe Manufacturing Co	48,448
Ham and bacon, P. G. Cromwell	48,451
Hams, P. G. Cromwell	48,450, 48,452
Hats, soft and stiff fur-felt, No Name Hat Mfg. Co.	48,506
Heel plates, electric, E. H. Mealy	48,552
Knives, forks and spoons which are made of steel and tinned, R. Wallace & Sons Mfg. Co.	48,527
Lamp glasses and globes, Macbeth-Evans Glass Co.	48,502, 48,586
Lead, white, National Lead Co	48,525
Leather for the uppers of shoes, R. H. Foerderer	48,510
Leather, harness, Cappon & Bertsch Leather Co.	48,472
Malt extract, Theo. Hamm Brewing Co	48,514
Malt extract and peptonized malt foods, A. Lieber	48,501
Malt tonic, McAvoy Brewing Co	48,504
Meats, cured, George A. Hormel & Co	48,457
Medicated lozenges, J. I. Brown & Son	48,539
Medicine for the cure of enuresis and kindred troubles, F. Boettger	48,519



The Wonderful **"AUTO-MARINE MOTOR" $37.50**

- ENGINE ONLY

Weight 37½ lbs. Height 11¼ in.

Convert Your Row Boat Into a LAUNCH

Licensed under Joseph Day's patent, August 6, 1895. Other patents pending.

Rated at 1 h. p. Has shown nearly 2 h. p. No valves, gears, springs or cams. Jump spark. Reversible. Speed control. Only three moving parts. Could not be made better if it cost five times as much. **ORDER NOW**—they are selling so fast you may be disappointed later.

Auto-Marine Motors from 1 to 20 h. p.

Detroit Auto-Marine Co., 75 E. Congress St., Detroit, Mich.
Formerly Detroit Lackawanna Co.

ELECTRIC SEWING MACHINE MOTOR.—The instructions and numerous illustrations of details contained in this article will enable any mechanic of average ability to build an efficient motor that will operate a sewing machine. The cost of materials for this machine should not exceed five dollars. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 1210. Price 10 cents by mail, from this office and from all newsdealers.

GOODELL

No Fooling Around

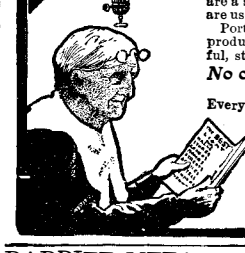
Business is business with our

HACK-SAW BLADES

They can always be found "on the job." They are thin and hard, built for use in rapid work—very rapid. Finest hot-rolled sheet steel used in their manufacture. For prices and sizes, *see our catalogue.*

GOODELL-PRATT COMPANY Greenfield, Mass.

THE "BEST" LIGHT



Spectacles and Eyeglasses

are a superfluity where our lamps are used.

Portable, 100-candle power and produces a safe, white, powerful, steady light with

No odor, dirt, grease or smoke.

Every lamp warranted. Costs 2c per week.

AGENTS WANTED EVERYWHERE.

The BEST LIGHT CO.
Owners of Original Patents.
87 E. 5th St., Canton, O.

BABBITT METALS.—SIX IMPORTANT formulas. SCIENTIFIC AMERICAN SUPPLEMENT 1123. Price 10 cents. For sale by Munn & Co. and all newsdealers. Send for catalogue.

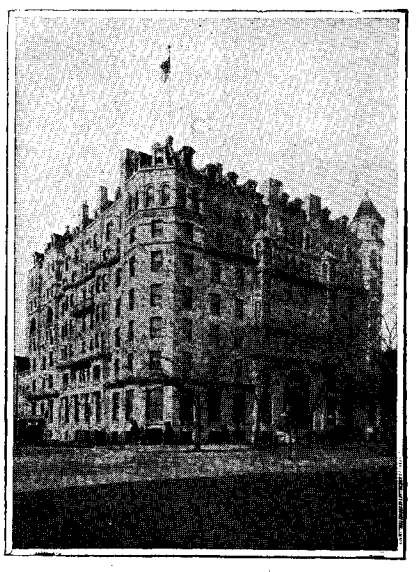
Your Crooked Legs

Made to appear ***Straight*** by the ***Perfect Leg Form.*** Undetectable. Fits any leg. Light as a feather. ***Perfectly comfortable.*** Sent postpaid in plain package with complete instructions for ***only two dollars ($2.00).*** Correspondence confidential. Write today.

PATENT ALLOWED

THE SYM-FORM CO.
221 Monroe Street, Chicago, Ill.

"Have Some Style About You"



THE SHOREHAM,

WASHINGTON, D. C.

The Leading Fashionable Hotel

METROPOLITAN STANDARD OF EXCELLENCE. ABSOLUTELY MODERN AND HIGH CLASS IN ALL DETAIL. AMERICAN AND EUROPEAN PLAN

JOHN T. DEVINE, PROPRIETOR

START THE NEW YEAR

BY SUBSCRIBING FOR THE

Scientific American AND Scientific American Supplement

Combined Rates $7.00 a Year

MUNN & CO., 361 Broadway, New York

Motor Supplies

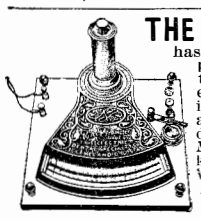
OF ALL KINDS
ALL LEADING LINES CARRIED

OUR SPECIALTIES

Clean Stock
Latest Styles
Prompt Shipments
No Substitutions
Right Prices

Those interested in—
Motor Cars
Motor Boats
Motor Cycles
—should have *Our Catalog*
It is Complete and Attractive and
Will Save You Money

THE BECKLEY-RALSTON CO.
86, 88 and 90 Michigan Ave., CHICAGO



THE PRICE PYROMETER
has revolutionized all methods of pyrometry. This instrument is the most efficient and reliable ever invented for the purpose, indicating temperatures as high as 800 to 3000 Fahr. Attractive, durable and highly sensitive. Manufacturers guarantee to keep it in order for one year. Write for particulars and prices.
ELECTRIC DENTAL SPECIALTY CO.
2241 Euclid Ave., Cleveland, O.

Mound City Dishwasher

The Only Scientifically Constructed Dishwasher on the Market

No More Drudgery Dishwashing Made Easy

Washes all kinds of dishes, glass and silverware. Can be used on gas, oil, wood or coal stove. Family size will wash 20 to 30 assorted pieces at one time.

There is more popular demand for a cheap, practical and durable Dishwasher than any article that can be mentioned. Every lady wants one. Agents wanted

Our agents, both men and women, are making Big Money. Secure the agency for this wonderful seller in your territory. Agents wanted in all foreign countries. Send at once for testimonials, full particulars and prices.

Mound City Dishwasher Co., 3685 Laclede Ave., St. Louis, Mo.

WIRELESS TELEGRAPH
The "Telimco" Complete Outfit, comprising 1 inch Spark Coil, Balls, Key, Coherer with Auto Decoherer and Sounder, 50 Ohm Relay, 4 Cell Dry Battery, Send and Catch Wires, and Connections, with Instructions and Diagrams. Will work up to 1 mile. Unprecedented introduction prices. Agents Wanted. Illustrated Pamphlet.
ELECTRO IMPORTING CO., 32 Park Place, New York

THE HANNA MFG. CO.
Engineering Instruments
382 River Street, Troy, N. Y.
Illustrated Catalogue on Application

WEBSTER'S INTERNATIONAL DICTIONARY

IT IS UP TO DATE AND RELIABLE
RECENTLY ENLARGED WITH
25,000 New Words and Phrases
ALSO ADDED
New Gazetteer of the World
New Biographical Dictionary
Editor in Chief, W. T. Harris, Ph.D., LL.D., United States Commissioner of Education.
2380 Quarto Pages. 5000 Illustrations.
IT IS A PACKED STOREHOUSE OF ACCURATE INFORMATION.
GRAND PRIZE (Highest Award) WORLD'S FAIR ST. LOUIS.
Also **Webster's Collegiate Dictionary**
1116 Pages. 1400 Illustrations.
Regular Edition 7 x 10 x 2⅝ inches. 3 bindings.
De Luxe Edition 5¾ x 8⅝ x 1½ in. Printed from same plates, on bible paper. 2 beautiful bindings.
FREE, "Dictionary Wrinkles," also Illustrated pamphlets.
G. & C. MERRIAM CO.
Publishers, Springfield, Mass., U. S. A.
GET THE BEST

60 YEARS' EXPERIENCE
PATENTS
TRADE MARKS
DESIGNS
COPYRIGHTS &c.

Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. HANDBOOK on Patents sent free. Oldest agency for securing patents.
Patents taken through Munn & Co. receive *special notice*, without charge, in the

Scientific American.

A handsomely illustrated weekly. Largest circulation of any scientific journal. Terms, $3 a year; four months, $1. Sold by all newsdealers.
MUNN & Co. 361 Broadway, **New York**
Branch Office, 625 F St., Washington, D.C.

Molasses taffy, candy kisses, and other candies, Robert F. Mackenzie Co..... 48,516
Mustard, C. Gulden 48,460
Mustard and spices, Tone Bros. 48,467
Olives, C. Gulden 48,459
Overalls, blouses, coats, vests, and trousers, Oshkosh Clothing Manufacturing Co.... 48,509
Overcoats, coats, vests and trousers, men's and children's, Myers & Andrews..... 48,505
Paint, acid, heat, water, and weather proof and wood and metal preservative, Hydro-Carbon Manufacturing Co. 48,530
Paper board and envelops or receptacles made therefrom, Thompson & Morris Co. 48,487
Pens, C. Howard Hunt Pen Co..... 48,474
Perfume for repelling mosquitos, Ceylon Perfume Co. 48,520
Pills and tablets for diseases of the blood, liver, stomach, bowels, kidneys, and nerves, C. F. York..... 48,538
Printing machines, rotary type, American Multigraph Co. 48,529
Remedies for certain named diseases, Radio-Sulpho Co. 48,533
Remedies for diseases of the throat, lungs, and bronchial organs, H. Stringer..... 48,558
Remedy and tonic, headache, G. C. Holden 48,524
Rubber overshoes, Adams and Ford Co.... 48,598
Salve and ointment, E. J. Koernlein..... 48,549
Sardines and like fish, Wells, Stone & Co.. 48,468
Saws, E. C. Atkins & Co..... 48,453
Sewing machines, A. G. Mason..... 48,551
Shears and scissors, Graef & Schmidt..... 48,458
Shoe dressing, Geo. E. Keith Co..... 48,478
Shoes, leather, Battreall-Whittinghill Shoe Co. 48,495
Shrimp, packed, Barataria Canning Co.... 48,447
Silver plated flat ware, hollow ware, and tableware, W. A. Rogers, 48,491 to 48,493, 48,537
Soap, F. T. Hopkins 48,479
Soap, laundry and toilet, F. G. Burke..... 48,471
Soups, condensed, Joseph Campbell Co.... 48,461
Stoves, removable oven for cooking, E. H. Huenefeld 48,480
Suspenders, men's, L. Oppenheimer's Sons. 48,507
Syrups, flavorings, tonics, and extracts for non-intoxicating aerated beverages, Brand Brothers Co. 48,518
Taps and bushes, American Tap Bush Co... 48,446
Underwear, cotton, wool, silk, and linen, Chalmers Knitting Co. 48,473
Vermifuges or worm syrups, S. W. Smith.. 48,613
Vests, double-breasted buttonless infants', M. Lowenthal & Brother 48,482
Washing machines, Whipple Brothers Co .. 48,489
Water supply tanks and valves therefor, Staples Valve Co. 48,466
Weighing machines and parts thereof, E. and T. Fairbanks and Co. 48,454
Wine, P. Freiler 48,523
Wines, S. Hochstadter 48,547
Wines, bitter, J. Triner 48,569
Wines, sparkling, White Top Champagne Co. 48,536
Whisky, H. & H. W. Catherwood..... 48,540
Whisky, Columbia Distilling Co. 48,541
Whisky, Frankel, Regenthal and Damler, 48,543 to 48,546
Whisky, J. & E. Mahoney..... 48,550
Whisky, Rubel-Lilienfeld Co.....48,553, 48,554
Whisky, I. Solomon 48,555
Whisky, Straus Brothers Co. 48,556, 48,557
Whisky, Angelo Myers Distillery..... 48,559
Whisky, D. L. Moore Distillery Co..... 48,560
Whisky, Wakeman Distilling Co..... 48,567
Whisky, G. V. Wendel 48,570
Whisky, Bernheim Distilling Co. 48,571
Whisky, Chicago Distilling Co. 48,575
Whisky, G. F. Coshland & Co. 48,577
Whisky, Goodkind Bros. 48,578
Whisky, Hagen & Travers 48,580
Whisky, Hannah & Hogg..... 48,581
Whisky, H. Kahn 48,583
Whisky, Klein Bros. 48,584
Whisky, S. E. Levi 48,585
Whisky, Many, Blanc & Co. 48,587
Whisky, A. Myers 48,588, 48,589
Whisky, Nelson Distilling Co. 48,590
Whisky, Old Tonic Distillery Co. 48,591
Whisky, Oregon Importing Co. 48,592
Whisky, C. H. Ross & Co. 48,593
Whisky, F. Schueler 48,594
Whisky, J. Spengler 48,595
Whisky, Strauss, Pritz & Co. 48,596
Whisky, Albert M. Gugenheim Co. 48,597
Whisky, D. Kelly Co.....48,600, 48,601
Whisky, J. W. Evendon Co. 48,602
Whisky, Standard Distilling Co. 48,603
Whisky, Ullman Einstein Co. ....48,604 to 48,606
Whisky, Wakeman Distilling Co. 48,608
Whisky, William Werder & Son Co. 48,609
Whisky, Weideman-Fries Co. 48,610
Whisky, H. Weil & Sons ..... 4 8 [illegible]
Whiskies, rye and Bourdon, P. Jones & Co. 4 8 48

LABELS.

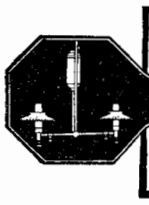
"Abdulla & Co., Ltd.," for cigarettes and cigarette tobacco, Abdulla & Co..... 12,588
"Fig yeast," for yeast, F. Wedehase..... 12,589
"Mount Harrison Brand," for oranges, F. L. Sewall 12,590
"Mystic Cream," for a toilet preparation, Ogden and Shimer 12,591
"Pride of Kentucky," for bleached cotton, J. M. Robinson, Norton & Co. 12,592
"Snow-white Towel Duplex Weave," for towels, R. Wise 12,593

PRINTS.

"A Toast," for shoes, Brown Shoe Co. 1,539
"A Wisconsin Deer Hunt. The return—Two Bucks," for beer, Meek Company. 1,530
"Argo Salmon—Delicious Baked," for salmon, Alaska Packers Association..... 1,533
"Argo Salmon—Salmon Chowder," for salmon, Alaska Packers Association 1,535
"Argo Salmon—Salmon Fritters," for salmon, Alaska Packers Association..... 1,532
"Argo Salmon—Stuffed Eggs," for salmon, Alaska Packers Association 1,534
"Attention Boys and Girls," for shoes, Brown Shoe Co. 1,537
"Buster Brown Blue Ribbon Book," for shoes, Brown Shoe Co. 1,547
"Buster Brown Guards on Parade," for shoes, Brown Shoe Co. 1,541
"Buster Brown Heart," for shoes, Brown Shoe Co. 1,544
"Harry Tether," for shoes, Brown Shoe Co. 1,536
"Jane and I," for shoes, Brown Shoe Co.. 1,546
"Little Indians Snow and Crow," for shoes, Brown Shoe Co. 1,543
"Little Jakkie Horner," for shoes, Brown Shoe Co. 1,540
"100 Yard Dash," for shoes, Brown Shoe Co 1,548
"Punjap," for a game, Blanchard & Co. .. 1,549
"Sammie so Haughty," for shoes, Brown Shoe Co. 1,542
"Shoot 'Infallible' Powder for Field and Trap," for powder, E. I. Du Pont Co. 1,550
"The Cowboy's Delight," for whisky, Meek Co. 1,531
"The Praise of Buster Brown Blue Ribbon Shoes," for shoes, Brown Shoe Co. 1,538
"The Return of Jakkie Horner," for shoes, Brown Shoe Co. 1,545
"Under the Evening Light," for ale, Meek Co. 1,529
"Your old trunk or baggage made as good as new," for trunks and baggage, Emergency Baggage Repair Co. 1,551

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.



7th Year of Success. THE "SUN" OUTSHINES THEM ALL.
Makes its own gas. No greasy wicks; no smoky chimneys; no odor; no bother.
The "SUN" INCANDESCENT HYDRO-CARBON LAMP
Strong, brilliant light, indispensable to all who use the eyes. Conforms to insurance underwriters' rules. Branch supply depots in all large cities. Liberal commission to agents. Get catalog.
SUN VAPOR LIGHT CO. BOX 939, CANTON, OHIO.
Licensees of the Campbell patent.

LET US BE YOUR FACTORY
WRITE FOR ESTIMATE ON ANY ARTICLE YOU WANT MANUFACTURED
STAMPINGS, MODELS, EXPER. WORK
WRITE FOR FREE BOOKLET
THE GLOBE MACHINE & STAMPING CO.
970 Hamilton St., Cleveland, O.

Men and boys wanted to learn PLUMBING TRADE pays $5 a day after completing course of practical instruction at home or in our schools. Graduates admitted to Union and Master Plumbers' Association. Positions secured. COYNE BROS. CO. PLUMBING SCHOOLS, 239 Tenth Avenue, New York. Chicago, Ills., Cincinnati, O., St. Louis, Mo. Free catalog.

ICE MACHINES Corliss Engines, Brewers' and Bottlers' Machinery. THE VILTER MFG. CO. 899 Clinton St., Milwaukee, Wis.

MODELS & EXPERIMENTAL WORK.
Inventions developed. Special Machinery.
E. V. BAILLARD, 24 Frankfort Street, New York.

RUBBER Expert Manufacturers Fine Jobbing Work
PARKER, STEARNS & SUTTON, 228-229 South St., New York

EXPERIMENTAL WORK Scientifically and accurately executed. Models and small machinery perfected. STENDICKE & VOLKMER, 61 Fulton Street. Telephone 5655 John.

Experimental Work. Designs for Automatic Machinery. G. M. MAYER, M.E., 1131 Monadnock Bl., Chicago, Ill.

DRYING MACHINES. S. E. WORRELL Hannibal, Mo.

Dies, Tools, Models and Special Machinery. Metal Specialties and Stampings Manufactured.
HOEFT & MOORE, Chicago, U. S. A.
OFFICE 88 Fifth Avenue. WORKS Indiana & Franklin Streets

DIAMOND TOOLS For Mechanical Purposes.
John Wennstrom's Sons Co., 356 41st St., Brooklyn, N. Y.

MODELS dies, boxes, metal stampings, patent articles novelties, manufactured and sold. Printing on aluminum. U. S. Novelty Co., Lily Dale, N. Y.

THE SCHWERDTLE STAMP CO.
STEEL STAMPS, LETTERS & FIGURES.
BRIDGEPORT CONN.

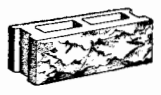
MODELS AND EXPERIMENTAL WORK
Inventions developed. Special machinery. Milliken Machine Works, 79 & 81 Washington St., Brooklyn, N. Y.

Experimental & Model Work
Cir. & advice free. Wm. Gardam & Son, 45-51 Rose St, N.Y

INVENTORS.—Our specialty is practically developing inventions. Design and build special, plain and automatic machinery, presses, dies, models, patterns and jigs. Send for Booklet No. 5.
A. NACKE & SON, 236-42 S. 9th St., Philadelphia, Pa.

NOVELTIES & PATENTED ARTICLES
MANUFACTURED BY CONTRACT. PUNCHING DIES. SPECIAL MACHINERY.
E. KONIGSLOW STAMPING & TOOL WORKS, CLEVELAND, O.

Telegraphy Circular free. Wonderful automatic teacher. 5 styles $2 up. OMNIGRAPH CO., Dept. 52, 39 Cortlandt St., New York.



A MONEY MAKER
Hollow Concrete Building Blocks. Best, Fastest, Simplest, Cheapest Machine. Fully guaranteed.
THE PETTYJOHN CO.
615 N. 6th Street, Terre Haute, Ind

GOVERNMENT POSITIONS
50,830 Appointments
were made to Civil Service places during the past year. Excellent opportunities for young people. Each year we instruct by mail hundreds of persons who pass these examinations and receive appointments to life positions at $840 to $1200 a year. There is a great demand for Patent Office eligibles. Write for our Civil Service Announcement, containing dates, places for holding examinations, and questions recently used by the Civil Service Commission.
COLUMBIAN CORRESPONDENCE COLLEGE, - Washington, D. C.

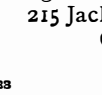
Electric Supplies and Novelties
Catalog of 200 pp. free. If it's Electric we have it.
OHIO ELECTRIC WORKS, Cleveland, O.
The World's Headquarters for Electric Novelties, Supplies, Books. We Undersell All. Want Agents.

AUTO STORAGE BATTERIES ALL KINDS
THE WILLARD STORAGE BATTERY CO. CLEVELAND, O

AGENTS
wanted to sell patented improvement for Oliver Typewriters. 100,000 machines in use. Big chance for hustlers. Sample $1. Sells for $3. Order and start at once.
APPLIANCE MFG. CO., 112 N. 4th St., St. Louis, Mo.

WANTED.—Master Machinist, $6 00 per diem, Naval Station, New Orleans, La. A competitive examination will be held for the above position at the Navy Yard, Brooklyn, N. Y., January 10, 1906. For further information apply to Commandant, Navy Yard, Brooklyn, N. Y.

LEARN WATCHMAKING
We teach it thoroughly in as many months as it formerly took years. Does away with tedious apprenticeship. Money earned while studying. Positions secured. Easy terms. Send for catalog.
ST. LOUIS WATCHMAKING SCHOOL, St. Louis, Mo.



Magical Apparatus.
Grand Book Catalogue. Over 700 engravings 25c. Parlor Tricks Catalogue, free.
MARTINKA & CO., Mfrs., 493 Sixth Ave., New York.

MASON'S NEW PAT. WHIP HOIST
for Outrigger hoists. Faster than Elevators, and hoists direct from teams. Saves handling at less expense.
Manfd. by VOLNEY W. MASON & CO., Inc. Providence, R. I., U. S. A.

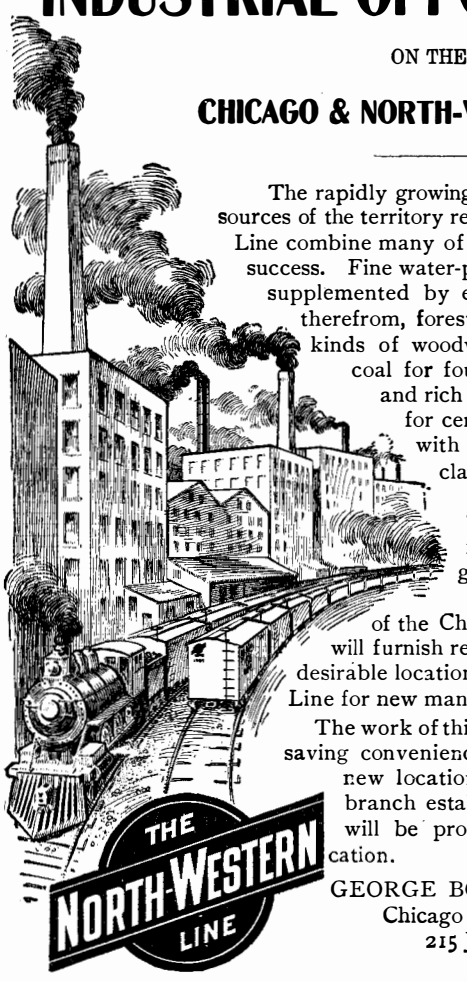
TYPEWRITERS ALL MAKES
All the Standard Machines at ⅓ to ½ M'f'r's prices. SOLD or RENTED ANYWHERE RENTAL APPLIED on price. Shipped with privilege of examination. Write for "Cat."
TYPEWRITER EMPORIUM, 202 LaSalle Street, CHICAGO

INVENTORS We manufacture METAL SPECIALTIES of all kinds, to order; largest equipment; lowest prices. Send sample or model for low estimate and best expert advice **FREE**
THE EAGLE TOOL CO., Dept. A, Cincinnati, O.

INDUSTRIAL OPPORTUNITIES

ON THE

CHICAGO & NORTH-WESTERN RAILWAY



The rapidly growing cities and the splendid resources of the territory reached by The North-Western Line combine many of the essentials to industrial success. Fine water-power locations that may be supplemented by electrical energy developed therefrom, forests furnishing material for all kinds of woodworking concerns, iron and coal for foundries and machine shops, and rich natural deposits of material for cement, pottery, brick and tile, with an ample supply of a good class of labor.

The complete service of The North-Western Line affords access to steady and growing markets.

The Industrial Department of the Chicago & North-Western Ry. will furnish reliable information regarding desirable locations along The North-Western Line for new manufacturing enterprises.

The work of this department affords a time-saving convenience to manufacturers seeking new locations or desiring to establish branch establishments, and information will be promptly furnished upon application.

GEORGE BONNELL, Industrial Agent
Chicago & North-Western Ry.,
215 Jackson Boulevard,
Chicago.

THE PIONEER LINE
WEST AND NORTHWEST OF CHICAGO. NW833

New York Belting and Packing Co.

LIMITED

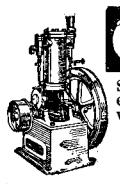
Manufacturers of High Grade

Rubber Belting

Diaphragms, Dredging Sleeves, Emery Wheels; Air Brake, Steam, Suction and Garden Hose, etc., Mats, Matting, Interlocking Rubber Tiling. Also manufacturers of moulded and special rubber goods of every description.

Write for catalogue.

91-93 Chambers St., New York



CHARTER

Stationaries, Portables, Hoisters, Pumpers, Sawing and Boat Outfits, Combined with Dynamos.

Gasoline, Gas, Kerosene.

Send for Catalogue.

State Power Needs.

CHARTER GAS ENGINE CO., Box 148, STERLING, ILL.

Scales All varieties at lowest prices. Best Railroad Track and Wagon or Stock Scales made. Also 1000 useful articles, including Safes, Sewing Machines, Bicycles, Tools, etc. Save Money. Lists Free. CHICAGO SCALE CO., Chicago, Ill.

What Is Daus' Tip-Top?

TO PROVE that Daus' "Tip-Top" is the best and simplest device for making **100 copies** from pen-written and **50 copies** from typewritten original, we will ship complete duplicator, cap size, **without deposit,** on **ten (10) days' trial.**

Price $7.50 less trade discount of 33⅓ per cent. or **$5 Net**

The Felix A. B. Daus Duplicator Co., Daus Bldg., 111 John St., New York

---

CRUDE ASBESTOS

DIRECT FROM MINES

PREPARED ASBESTOS FIBRE for Manufacturers use

R. H. MARTIN, OFFICE, ST. PAUL BUILDING 220 B'way, New York.

Try Squares

CONCAVE Case Hardened Stock. Blades hardened to Spring Temper and graduated to 32ds and 64ths, 2 to 12 ins. long.

Write to-day for Catalogue No. 17 B.

THE L. S. STARRETT CO., Athol, Mass

Bausch & Lomb Microscopes

This is an invitation to send for our illustrated catalog of Microscopes if you are interested in best instruments for the least money, those that are used in the leading laboratories everywhere and by individual workers who know the best.

Bausch & Lomb Optical Co.

MANUFACTURERS

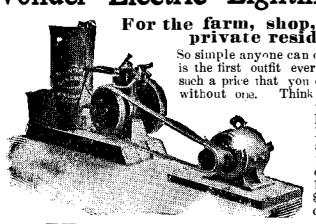
ROCHESTER, N. Y.

NEW YORK CHICAGO BOSTON

SAN FRANCISCO FRANKFORT A-M GERMANY

Wonder Electric Lighting Outfit

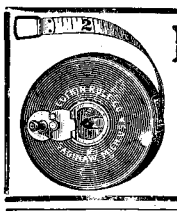
For the farm, shop, cottage, or private residence.



So simple anyone can operate them. This is the first outfit ever offered for sale at such a price that you cannot afford to be without one. Think of it; only one-tenth of a cent per hour for each 16 C. P. lamp. You can also use engine during the day for other purposes. A 12-light outfit only $100.00. Send for complete catalogue

THE R. M. CORNWELL CO.,

406 So. Salina St., - - Syracuse, N. Y.



LUFKIN

TAPES AND RULES

ARE THE BEST.

For sale everywhere. Send for Catalog No. 16.

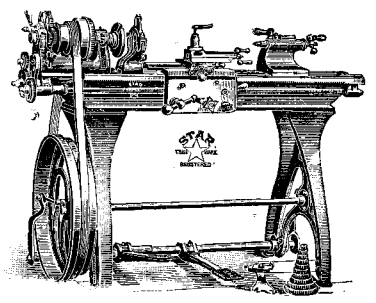
LUFKIN RULE CO.

Saginaw, Mich., U. S. A.

New York and London.

JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC.

WM JESSOP & SONS LTD 91 JOHN ST. NEW YORK



Accurate Work on Foot-Power Lathes

is considered next to impossible by many good mechanics, but such opinion is based on experience with cheaply built machines, and the amateurish reputation of foot power lathes.

In designing and building

"Star" FOOT POWER Lathes

ruts have been avoided and "Star" Lathes are unsurpassed in these essential points, high quality of material, workmanship and of results. "Star" Lathes are shipped on approval; if they fail to give entire satisfaction, may be returned at our expense.

Send for catalog "B"

Engine Lathes Bench Lathes
Foot Power Lathes
Speed Lathes Wood-Turning Lathes

THE SENECA FALLS MFG. CO.

656 Water St., Seneca Falls, N. Y., U. S. A.

Complete Only **$15.**

BURNS WOOD or COAL

JUST SEND ME ONE DOLLAR

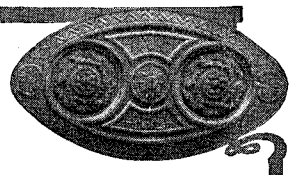
and I will ship C. O. D. to any railroad station in the U. S. this fine Willard Steel Range. Anyone can say they have the best range in the world, but I will furnish the evidence and leave the verdict to you. After you examine this range, if you are satisfied in every way, pay Agent $14.00 and freight, and you become the possessor of the best range in the world for the money. The range has six 8-inch lids; 18-inch oven; 15-gallon reservoir; large warming closet; top cooking service 30x34 ins. Guaranteed to reach you in perfect order. Shipping weight, 400 lbs. Thousands in use and every one of them giving satisfaction. Write for full description and testimonials.

WM. G. WILLARD

No. 12 WILLARD BUILDING
316-320 CHESTNUT STREET ST. LOUIS, MO

Mullins

Makes Everything In

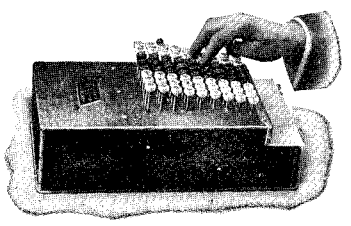


Art Architectural Sheet Metal Work

Statuary—Ornamental Sheet Metal Work—Skylights—Fireproof Windows—Art Metal Tile Roofing—Steel Ceilings—Finials—Wrought Iron Grilles—Cornices, etc., etc. Estimates, models and designs submitted for architects, builders and contractors.

Our 120-Page Catalogue of stock designs will be sent on request.

The W. H. Mullins Co., 203 Franklin Street, Salem, Ohio.



Have you a clear understanding of the many uses to which the Comptometer is being put, and the great variety of accounting work in which it saves from 50% to 80% of the time usually required, besides insuring accuracy and doing away with headaches and overtime. If not, let us tell you about it, or better still, send a machine for you to try on your own work.

Our New Model Duplex Comptometer will surprise you. It is as far ahead of the Old Model as the Old Model was ahead of mental work.

Some repeat orders. Why did they buy more?

U. S. NAVY DEPARTMENT	117	AMERICAN BRIDGE CO., Pittsburgh, Pa.	17
MARSHALL FIELD & CO., Chicago, Ill.	135	WESTERN ELECTRIC CO., New York and Chicago	35
JOHN WANAMAKER, New York and Philadelphia	48	PRUDENTIAL INSURANCE CO., Newark, N. J.	23
CARNEGIE STEEL CO., Pittsburgh, Pa.,	46	METROPOLITAN LIFE CO., New York	23
NEW YORK CENTRAL & HUDSON RIVER R. R. Co.	37	SIMMONS HARDWARE CO., St. Louis, Mo.	22
CHICAGO, BURLINGTON & QUINCY R. R. Co.	35	N. Y. SHIPBUILDING CO., Camden, N. J.	23

It is your next move. **Felt & Tarrant Mfg. Co., 57 N. Orleans Street, Chicago**

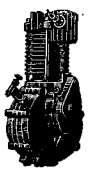
Opaque Projector

A Magic Lantern for showing Engravings, Prints, Cuts, Illustrations in Books, Models and Specimens on the Screen without previous preparation, brilliantly lighted and in natural colors. Send for circular.

Williams, Brown & Earle

Dept. 6, 918 Chestnut St., Philadelphia, Pa.

CONVERT YOUR BICYCLE INTO A MOTORCYCLE



at small cost and without alteration, by attaching the complete Power Outfit of the successful, self-starting,

ERIE 2 H. P. MOTORCYCLE

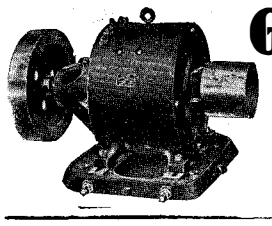
Easily attached by anyone. Motor weighs 25 lbs. Hundreds in use.

Complete MOTORS and CASTINGS, 2 to 5 H. P.

Complete parts to build your own motorcycle, $35 up.

SEND STAMP FOR CATALOGUE

THE MOTORCYCLE EQUIPMENT CO., 898 Main Street, BUFFALO, N. Y.



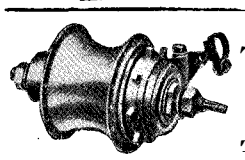
GAS ENGINE GENERATOR

STEADY LIGHT FROM AN ORDINARY GAS OR GASOLINE ENGINE

Not a makeshift, but a specially designed machine with bearings amply heavy to support balance wheel without a third bearing. Write for Bulletin 152

ROCHESTER ELECTRIC MOTOR CO.

10-12 Frank St., ROCHESTER, N. Y.



"STANDARD"

Two-Speed Automatic Coaster Brake Hub

Makes wheeling a delight, eliminates the drudgery. Do not waste money on experiments when you can buy a perfect attachment *all in* one hub. Our little booklet tells all about it and is mailed free. Write to-day.

THE STANDARD COMPANY - - - - Torrington, Conn.

Deafness Cured at Home

Don't waste your time and money in experiments. My method cures deafness and all head noises **to stay cured.** Absolute and positive proofs sent on application. **No pain,** no loss of time. The method is my own and cannot be obtained elsewhere, it has been tried and found true, **it cures.**

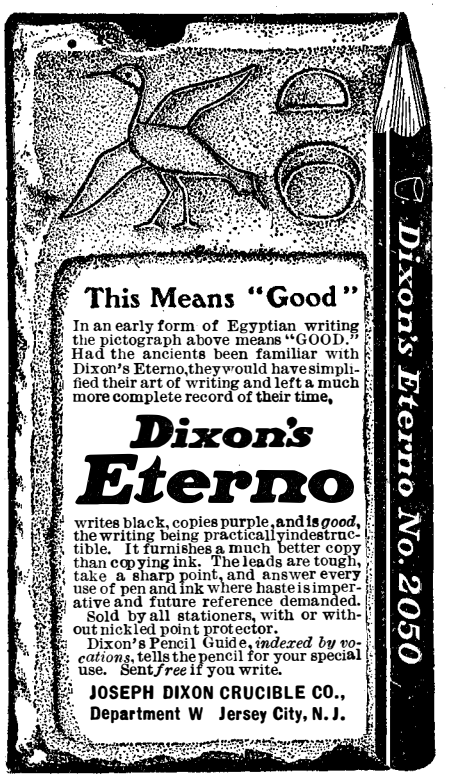
Write today for my book, "Deafness its Cause and Cure." FREE. Address

GUY CLIFFORD POWELL, M.D. *565 Bank Bldg., Peoria, Ill.*

ROAD BUILDING MACHINERY

AND CONTRACTORS SUPPLIES

ACME ROAD MACH'Y CO., FRANKFORT, N.Y. U.S.A.



This Means "Good"

In an early form of Egyptian writing the pictograph above means "GOOD." Had the ancients been familiar with Dixon's Eterno, they would have simplified their art of writing and left a much more complete record of their time.

Dixon's Eterno

writes black, copies purple, and is *good*, the writing being practically indestructible. It furnishes a much better copy than copying ink. The leads are tough, take a sharp point, and answer every use of pen and ink where haste is imperative and future reference demanded.

Sold by all stationers, with or without nickled point protector.

Dixon's Pencil Guide, *indexed by vocations*, tells the pencil for your special use. Sent *free* if you write.

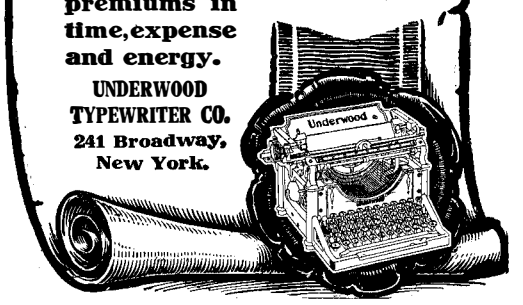
JOSEPH DIXON CRUCIBLE CO.,

Department W Jersey City, N. J.

Practical Business Insurance POLICY

Writing in Sight with Underwood Typewriter

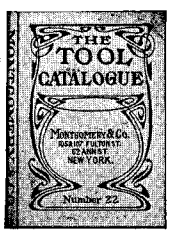
guarantees best work and greatest dividends at least premiums in time, expense and energy.



UNDERWOOD TYPEWRITER CO.

241 Broadway, New York.

Tools! Tools! Tools!



and all you want to know about them. Our Tool Catalogue No. 22 is a cloth-bound book of 950 pages. If you want to "know it all" about Tools you should send for this book at once. Sent post-paid on receipt of $1.00 which will be refunded from your first purchase from us of $10.00 or over.

MONTGOMERY & CO.

105 Fulton Street, N. Y. City

THE Nulite Vapor GAS Lamps

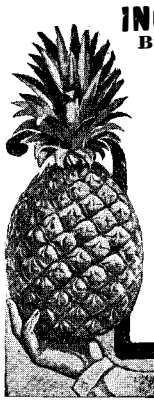
For Home, Store and Street

We also manufacture Table Lamps, Wall Lamps, Chandeliers, Street Lamps, Etc. 100 Candle Power seven hours ONE CENT. No Wicks. No Smoke. No Odor. Absolutely safe. THEY SELL AT SIGHT. Exclusive territory to good agents. ☞ Write for catalogue and prices.

Chicago Solar Light Co. Dept G, Chicago

INCREASE YOUR INCOME

By Owning a Producing Pineapple Plantation in Porto Rico



Our new illustrated book, **"Pineapples for Profit," tells all** about pineapples, their culture, their agricultural importance, their value as a product, the cost of the production as compared with the average price, where they are grown to the best advantage, how long it takes to grow and market a crop—and, most interesting of all, how Americans of modest means are, without interference with their present occupation or business, engaging in the culture of pineapples and finding it highly profitable. *We will send this book FREE to any man or woman who takes a serious interest in agriculture along modern lines.*

LA FORTUNA FRUIT CO.

Metropolitan Bldg., New York

GARDNER GRINDER FOR FLAT SURFACES

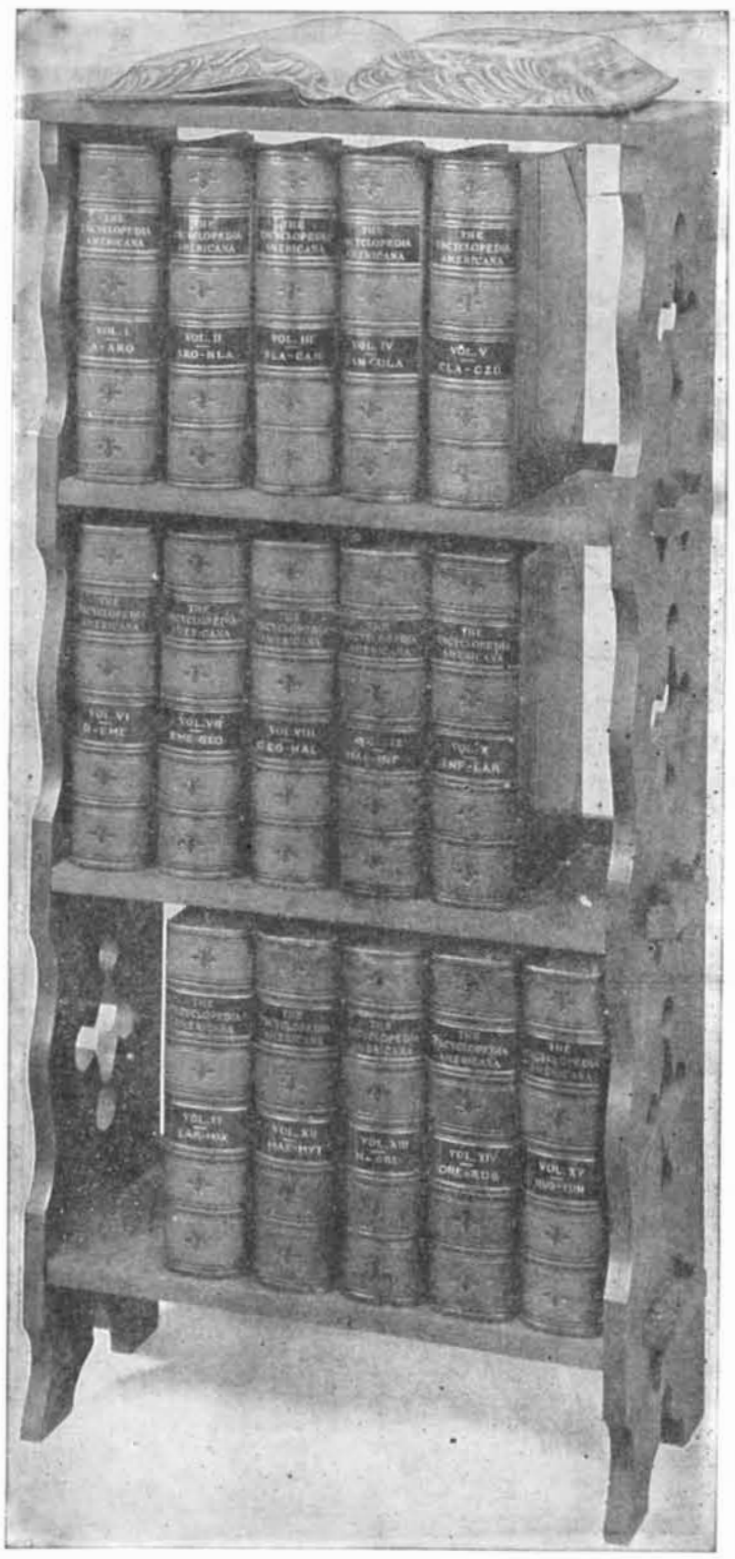
ACCURATE & RAPID FOR UP-TO-DATE SHOPS

GIBESLY & CO. CHICAGO ILL. U.S.A.

15 to 21 South Clinton Street.

Important Announcement

AT LAST AMERICA HAS A NATIONAL REFERENCE WORK, IN WHICH NORTH, SOUTH, EAST, WEST, CANADA AND SOUTH AMERICA HAVE FULL AND TRUE REPRESENTATION.



READERS OF THE SCIENTIFIC AMERICAN will be gratified to learn that the great work of reference upon which we have been so long engaged is at last completed. After years of patient labor and research and with the co-operation of America's foremost scholars and experts,

The New AMERICANA

stands as an achievement which has already met with the enthusiastic approval of the American people. It is now no longer necessary to consult foreign works of reference for information concerning American Biography, American History, American Industries, and our American Institutions.

The **AMERICANA** is the work which the condition of affairs in the Encyclopedic world made necessary. Before ever a line was written for this great work the *Ideal* was set: *A National Work—Universal in its information—American in its Production.*

The **AMERICANA** is distinctly a National Work. It is made by Americans. Every section of America has been called upon to contribute, and for the first time in a reference publication North, South, East and West, Canada and South America have full and true representation.

The **AMERICANA** is NEW FROM COVER TO COVER—new and beautiful type, new maps, new engravings and colored plates, new text illustrations, and, best of all, NEW AND ORIGINAL TREATMENT THROUGHOUT by the foremost

American Expert Authorities.

The **AMERICANA** is the work of a thoroughly organized body of skilled experts each selected for his special fitness and intimate knowledge of the subject assigned to him. These trained and progressive workers have struck out into *new paths;* they have proceeded upon *an entirely new plan* and that plan embodies the idea which has advanced our country to the front rank among the nations—the idea of *reaching the core of things by the shortest method.* This is the *American Plan.* You'll catch the spirit of it as you turn the pages of the work and note its conciseness yet comprehensiveness, while the names of the eminent writers of the signed articles are an ample assurance of accuracy and authoritativeness. The **AMERICANA** has commanded the services of so many distinguished educators, scholars and experts as to justify in the truest sense the title bestowed upon it—

"America's National System of Reference."

"I am truly delighted with the tone and arrangement of this strictly American publication."—B. J. CIGRAND,
Director Chicago Public Library.

"The treatment throughout is thoroughly American and conspicuously so in its wonderful compression. It goes straight to the core of each subject."
—EDGAR M. BARBER, C. P. A.,
U. S. Treasury Dept.

"The work breathes the spirit of to-day even in the description of things ancient. It explores the dark corners of the past by the aid of the arc light and radium."
—ST. PAUL PIONEER PRESS.

"I consider it in every respect, the best encyclopedia published."
P. N. JOHNSTON,
Reference Librarian, New York Public Library.

FREE ON REQUEST No mere advertisement can convey an adequate idea of the vast interest and immense utility of the AMERICANA, or of its exceptional value and sumptuous appearance. Let us send you therefore a handsome *120-page book* containing *specimen pages, maps, full-page plates, duo tones, color plates,* and *text illustrations,* with *portraits of celebrities,* full-page photographic plates *of the most interesting and up-to-date subjects—The Americana being the best illustrated of all reference works.* With the object of making the Americana quickly and widely known, before placing the work in the hands of dealers for general distribution, we will accept orders direct at a large reduction from the established price. Those interested are requested to make application immediately. The work is sold exclusively in connection with the SCIENTIFIC AMERICAN, and cannot be otherwise obtained.

SEND IN AT ONCE

REQUEST BLANK

SCIENTIFIC AMERICAN COMPILING DEPT.
258 Fifth Ave., New York City

Without obligating myself to purchase I would like to receive **FREE,** your 120 page Book of Specimen Pages, Maps, Duo tones, Color Plates, Portraits, etc., of the NEW AMERICANA, with particulars of your special low price advertising proposition.

Name_____

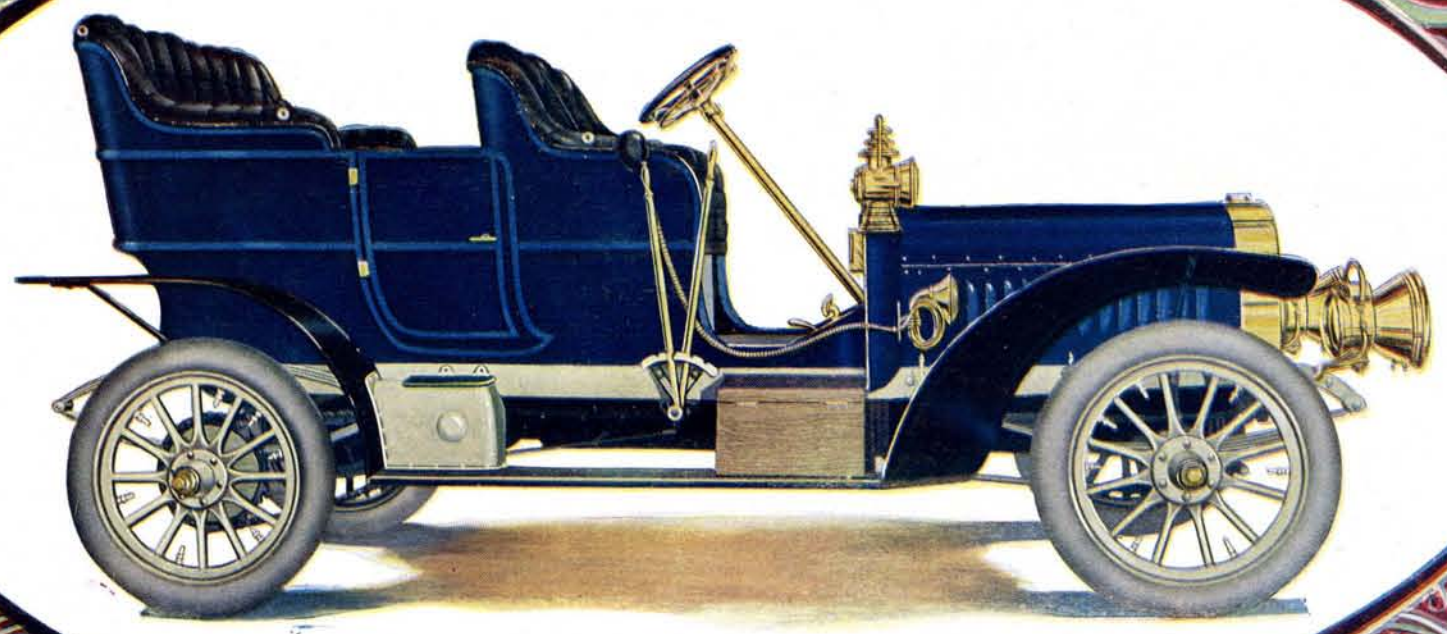
Occupation_____

Street_____

Town and State_____

CUT OUT AND MAIL TO-DAY

Rambler



Model 15, 35-40 H-P., $2500.

The Rambler line for 1906 includes seven models in two distinct types. Surreys One, Two and Three are general utility cars, equipped with double opposed motors and planetary transmission.

Extreme simplicity in construction and operation is a leading feature in these cars, making them the car par excellence for the daily service of those of no mechanical training.

Prices $1200, $1650, and $1350, respectively.

Models 14, 15 and 16 are cars embodying the most modern ideas in construction and design and equipped with four cylinder vertical motors, sliding gear transmissions, etc.

Model 14 is a medium weight touring car, with 20-25 horse power motor and shaft drive to differential in the rear axle. Price $1750.

Model 15, shown above, is a larger, more powerful car with side chain drive and fixed rear axle. Price $2500.

Model 16 is the Model 15 chassis with large roomy limousine body selling at $3000.

Model 18 is a runabout with double opposed motor, 10-12 horse power at $800.

All merit your consideration and full details are at your service.

Main Office and Factory, Kenosha, Wisconsin, U. S. A.

Branches:

Chicago, 302-304 Wabash Ave.
Milwaukee, 457-459 Broadway.
San Francisco, 125-131 Golden Gate Ave.

Boston, 145 Columbus Ave.
Philadelphia, 242 N. Broad Street
New York Agency, 134 W. 38 Street.

Thos. B. Jeffery & Company